NEWS BULLETIN

No.....

CONTENTS

; that soul was whose ·rogeny ·y are; y they do preserve as
rest efficacy and extraction of that living intellect that bred them.

—*John Milton*

Suggestions for Contributors

MANUSCRIPT offered for publication in *The Journal of Bone and Joint Surgery* should be sent to the Editor, 8 The Fenway, Boston, Massachusetts. All articles are acknowledged as soon as received and a reply sent as to the disposition of the articles as soon as possible after that date. Original articles are accepted only with the understanding that they are contributions exclusively to this *Journal*.

To aid in uniformity of presentation, it is requested that: —

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The original be sent to the editor, the author keeping a carbon copy as the original is not returned.

Photographs and drawings intended for illustrations be numbered, the top plainly indicated, and the author's name written on the back of each illustration. When x-rays are used, black and white prints should be furnished rather than negatives.

All lettering on prints and all drawings and charts be made in black India ink.

Legends be furnished in separate lists numbered to correspond with the illustrations.

Bibliography, if included, be prepared in one list at the end of the article, each reference to an article in a periodical to be given as follows:

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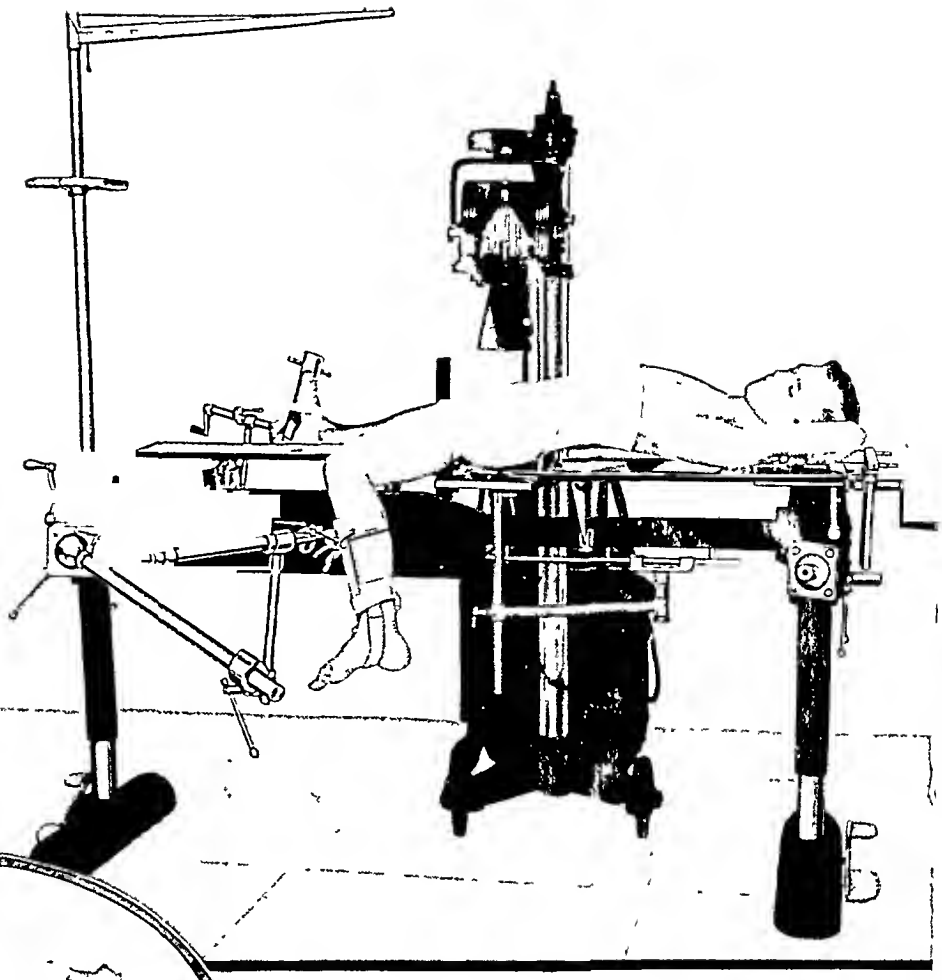

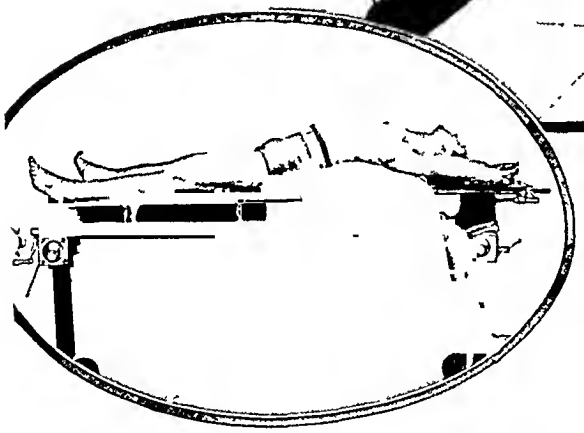

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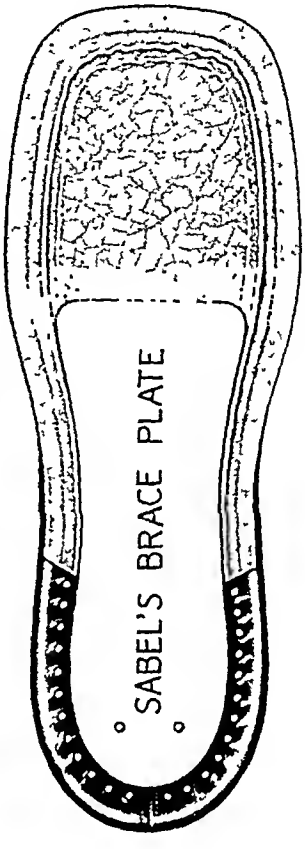

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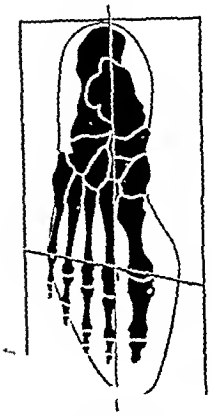
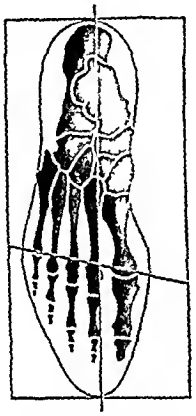


REGULAR
(*Fig. 1*)



FLAREWEDGE
(*Fig. 2*)

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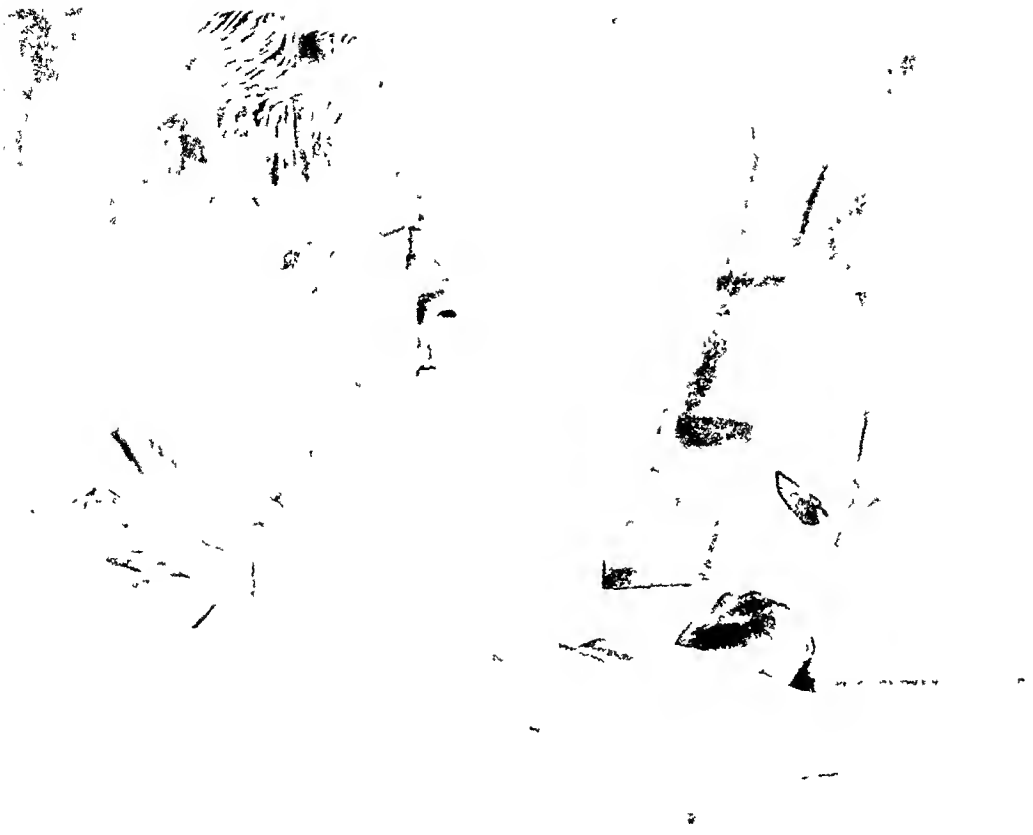

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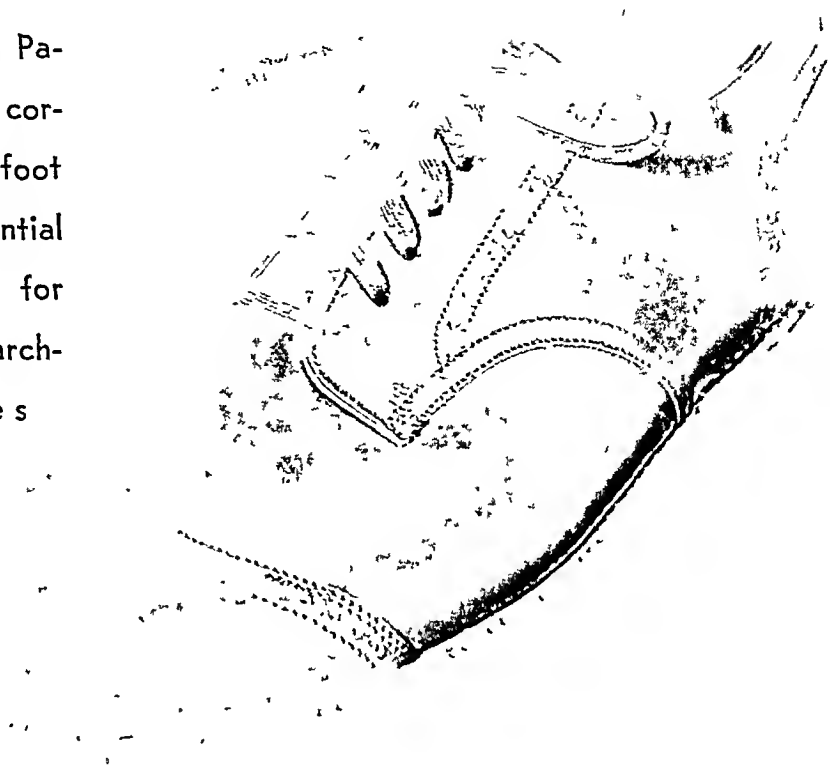

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The Journal of Bone and Joint Surgery

ARTHROPLASTY OF THE HIP

A New Method *

BY M. N. SMITH-PETERSEN, M.D., BOSTON, MASSACHUSETTS

Chief of Orthopaedic Department, Massachusetts General Hospital; Clinical Professor of Orthopaedic Surgery, Harvard Medical School

Up to the present time the procedure of arthroplasty has consisted in the shaping of two joint surfaces, mechanically suitable for function, and covering them with a lining that would tend to prevent re-ankylosis, as well as to allow the surfaces to glide against each other. In other words, the aim of the procedure has been to create all the elements that make up a joint,—joint surfaces, surface covering, and joint capsule. The blood clot that surrounds these structures at the conclusion of the operation organizes, forming a fibrous-tissue scar which tends to limit the function of the new joint; this is particularly true if it binds together the layers of the interposed lining. If it were confined to the capsular region, however, it would be less effective in inhibiting joint motion. This gave rise to the principle of the "two-stage, mold arthroplasty": By the introduction of an inert mold around which nature can do its repair work, two congruous surfaces, mechanically suitable for joint function, are created, and fibrous-tissue formation is confined to the periarticular region forming a joint capsule.

Glass molds (Fig. 1) were used at first, since glass is inert and causes a minimum amount of scar tissue to form. The use of glass had to be abandoned because some of the molds broke. Viscaloid, a form of celluloid, was then tried, but it caused too much foreign-body reaction. Even though the ideal material had not been found, the principle of the mold arthroplasty had been proved sound by the clinical and research work, and a preliminary report was published in 1925.[1] Eight years went by and still the right substance had not been found. In 1933 we went back to the use of glass (pyrex); the molds were considerably heavier and were tested under the polariscope for evidence of strain under compression. In spite

* Read at the Annual Meeting of the American Academy of Orthopaedic Surgeons, Memphis, Tennessee, January 18, 1939.

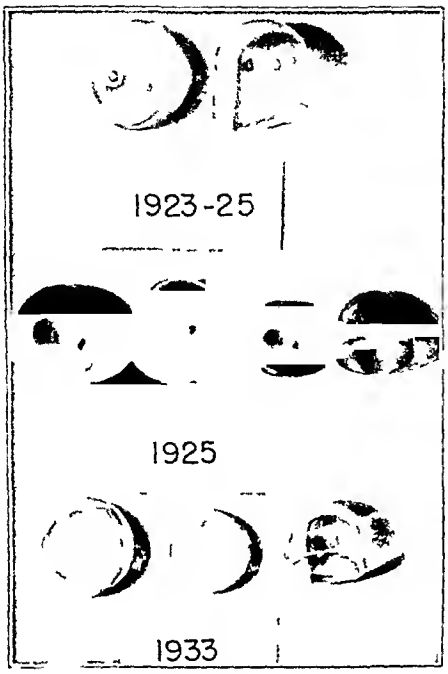

FIG. 1

Evolution of the mold:
1923: Glass.
1925: Viscaloid.
1933: Glass (pyrex).

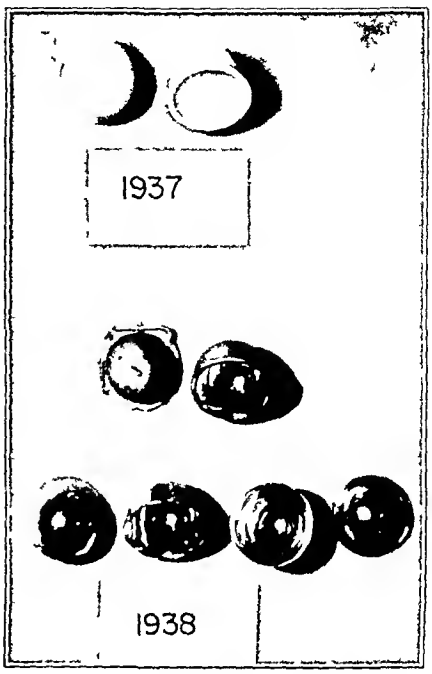

FIG. 2

Evolution of the mold:
1937: Bakelite.
1938: Unsuccessful and successful vitallium molds.

of this, some of these molds broke, but the majority stood up even under full weight-bearing. They were left in for periods varying from fifteen to twenty-five months.

In 1937 bakelite molds (Fig. 2) were made and used in one case; in this case the mold is still in place and the patient is doing well. At this

FIG. 3

Preoperative roentgenogram of case of bilateral ankylosis of the hip. Left, bony ankylosis; right, fibrous ankylosis.

advisability of using vitallium for this purpose. It was his opinion that it was entirely suitable, and, in June 1938, the first vitallium mold was inserted.

A case illustrating the use of a glass mold is that of a girl of nineteen,

FIG. 7

Section from femoral head.

FIG. 8

Section from acetabulum.

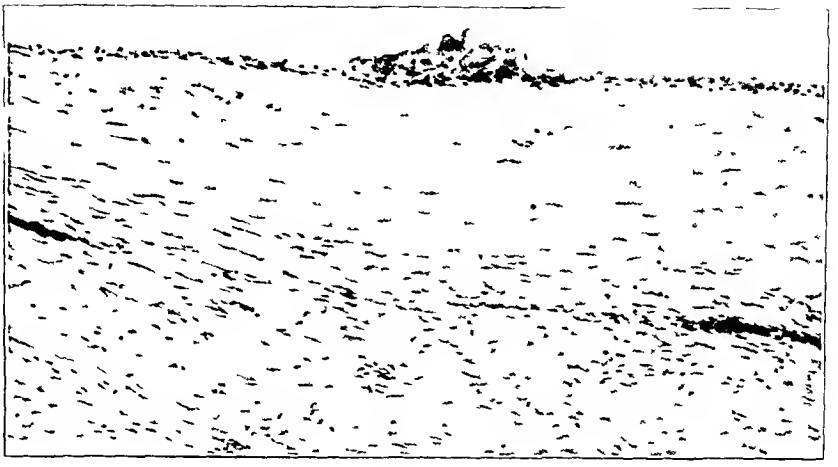

FIG. 9
Section from capsule.

FIG. 10
Section from femoral head.

with ankylosis of both hips, which occurred as a complication of scarlet fever at the age of three years. On the left, there was complete bony ankylosis, both by physical examination and by roentgenographic examination. On the right, there was no measurable mobility by physical examination, just an elastic give; the roentgenograms showed fibrous ankylosis (Fig. 3). A glass mold was inserted in the left hip and left in place for twenty-one months. At the end of this period there was only 40 degrees of motion in flexion from 30 degrees of permanent flexion; there was a fair amount of motion in rotation, as well as in adduction and abduction. The range of motion then was markedly limited, although not

FIG. 11

Preoperative roentgenogram, showing recurrence of ankylosis following fascia-lata arthroplasty for the relief of bony ankylosis.

FIG. 12

Same case as in Fig. 11, one month after insertion of glass mold.

FIG. 13

Same case as in Figs. 11 and 12, twenty months after removal of glass mold and three years after insertion of glass mold. No absorption of head and neck; 80 degrees of motion.

accompanied by pain. A roentgenogram (Fig. 5) taken at this time showed most satisfactory repair to have taken place, both inside and outside the glass mold. On removal of the mold, congruous joint surfaces were found; both the head of the femur and the acetabulum were covered by a firm, smooth, glistening lining, well adapted to joint function (Fig. 6). A fibrous capsule of no more than normal thickness had formed; it had a lining which grossly could not be differentiated from synovial lining. Even though we had all the elements present necessary for joint function, it was deemed unwise to expose this joint to the destructive effect of exercises required to restore satisfactory function. It must be kept in mind that this patient had an ankylosed hip on the other side as well, and that consequently the operated hip would be exposed to excessive wear and tear. Under the circumstances we were justified in removing specimens

FIG. 14

Preoperative roentgenogram of case of bilateral deformity of the hip.

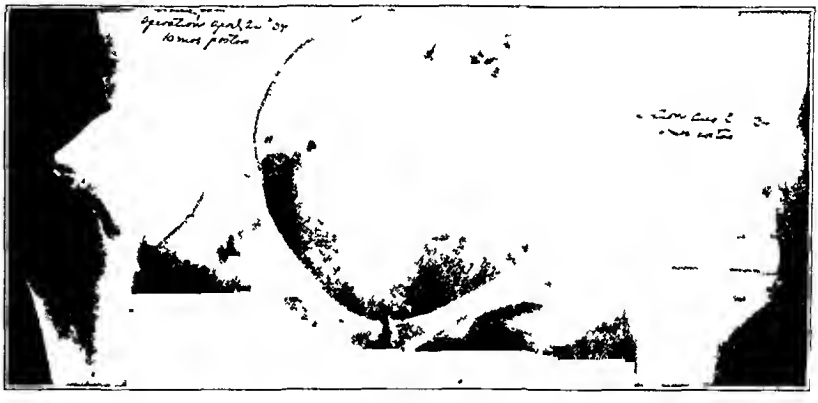

FIG. 15

Same case as shown in Fig 14, after bilateral arthroplasty with transplantation of the trochanter on the left, glass-cup arthroplasty on the right. Ten months after insertion of glass mold, no absorption of head and neck.

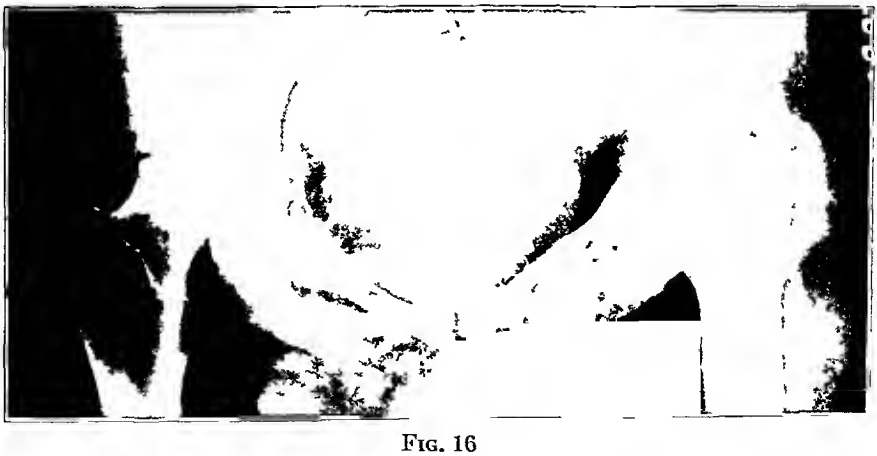

FIG. 16

Same case as shown in Figs. 14 and 15, three years after removal of glass mold and four and one-half years after insertion of glass mold. No absorption of head and neck, 70 degrees of motion in flexion

from the head of the femur, capsule, and acetabulum, and inserting a vitallium mold.

Histological examination of these specimens showed the newly formed joint surfaces to consist chiefly of fibrocartilage, which in some areas approximated hyaline cartilage in character; the newly formed capsule

FIG. 17

Preoperative roentgenogram of case of bilateral bony ankylosis of the hip.

FIG. 18

Same case as shown in Fig. 17. Bilateral arthroplasty with vitallium molds.

consisted of dense fibrous tissue with a true synovial lining (Figs. 7, 8, and 9). In another case, in which the mold remained in place for twenty-five months, a specimen from the femoral head showed highly developed hyaline cartilage (Fig. 10). These sections are the best that we have obtained in our histological studies of the type of repair which takes place in response to an inert mold interposed between two cancellous-bone surfaces. Normal mechanical conditions of friction and pressure must obtain for this type of repair to take place; this is our unproved conviction. For this reason, the mold is held in place by position only, so that the femoral head can move inside the mold and the mold can move inside the acetabulum.

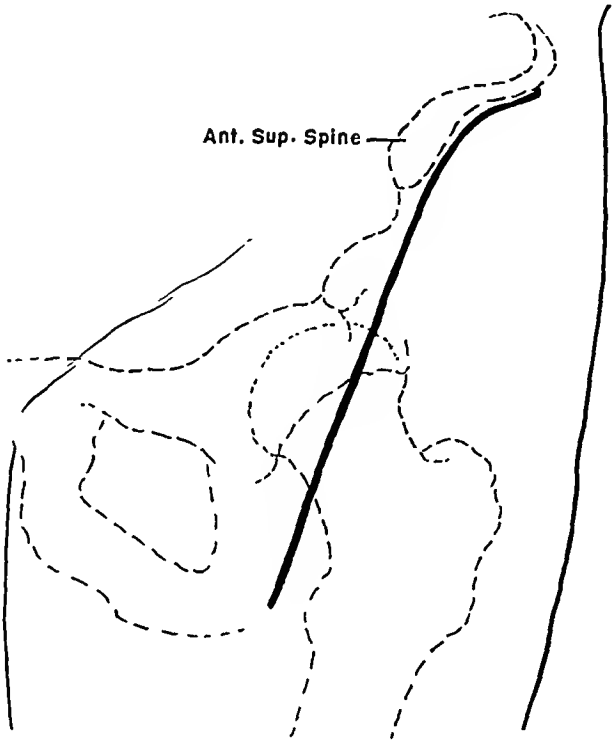

FIG. 19

Gradual absorption of the head and the neck of the femur sometimes occurs in fascia-lata arthroplasties. This has not been observed in the cases operated upon by the glass-mold method. Unfortunately in only three cases has the mold been in place for a period long enough to justify us in drawing conclusions. Figures 4 and 5 show the roentgenographic appearance in one case one year after operation and twenty-one months after operation; there is no apparent evidence of absorption. The other two cases are shown in Figures 11, 12, 13, 14, 15, and 16. These three cases are not sufficient to prove this point, but with the use of vitallium molds, which in all probability may be left in place indefinitely, additional knowledge on this point will be gained.

Fifteen years have elapsed since this work was started. That the principle of the two-stage mold arthroplasty is sound was proved by the use of the glass molds. Since these are radiotransparent, it has been possible to follow the different stages of bone repair. The fear that the molds might break has restrained us as far as effective exercising is concerned. With the advent of vitallium this restraint has been removed, and the postoperative course of events has been accelerated. The question now arises whether the original mold principle may not have to be

sacrificed; if vitallium proves to be inert, even when interposed between two moving surfaces, there may be no reason for the second stage,—that is, the removal of the mold. We must keep in mind the possibility of absorption of the head and neck, as has already been pointed out. A typical case of bilateral bony ankylosis of the hip, treated by arthroplasty with the vitallium molds, is shown in Figures 17 and 18.

OPERATIVE TECHNIQUE

A satisfactory exposure of the hip joint has always been difficult to obtain until the approach for "acetabuloplasty"[2] was developed. The steps for the approach for arthroplasty are essentially the same as those for acetabuloplasty.

The incision extends along the anterior third of the iliac crest to the anterior superior spine, and then curves slightly medially along the lateral border of the sartorius muscle (Fig. 19). Immediately inferior to the anterior superior spine one finds the plane of division between the sartorius and the tensor fasciae femoris. The femoral fascia is incised along the lateral border of the sartorius, exposing the direct head of the rectus femoris. By sharp and blunt dissection the attachment of the direct head of the rectus femoris to the anterior inferior spine is defined (Fig. 20).

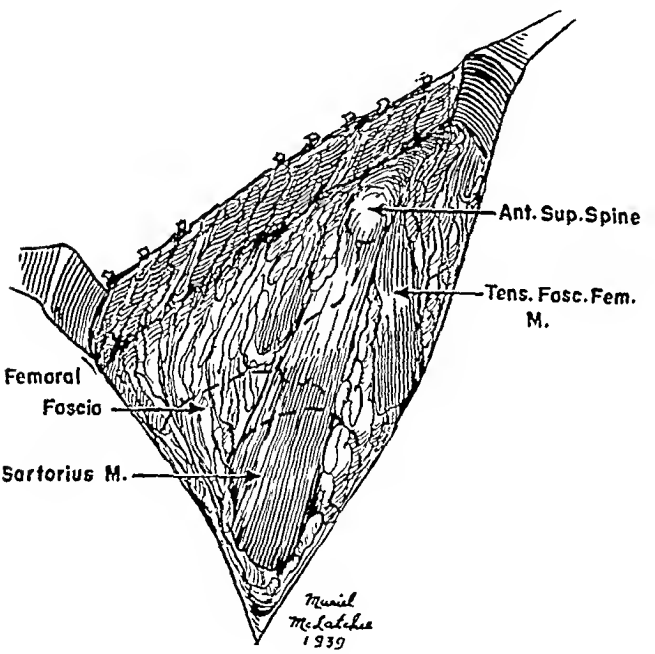

FIG. 20

Between the origin of the abdominal oblique and the sartorius muscles mesially and the gluteus medius and the tensor fasciae femoris muscles laterally is a definite sulcus, which should be defined before the periosteum is incised and reflected from the anterior iliac crest and the anterior superior spine. (See Figure 21.) By incising the periosteum between the anterior superior spine and the anterior inferior spine one can reflect the iliacus subperiosteally from the iliac fossa. A blunt instrument is then inserted mesial to the anterior inferior spine in order to get a lead to the plane of division between the main portion of the iliacus muscle and its marginal origin. The author has found this procedure very helpful. The tendon of the rectus femoris (Fig. 22) is divided just below its origin from

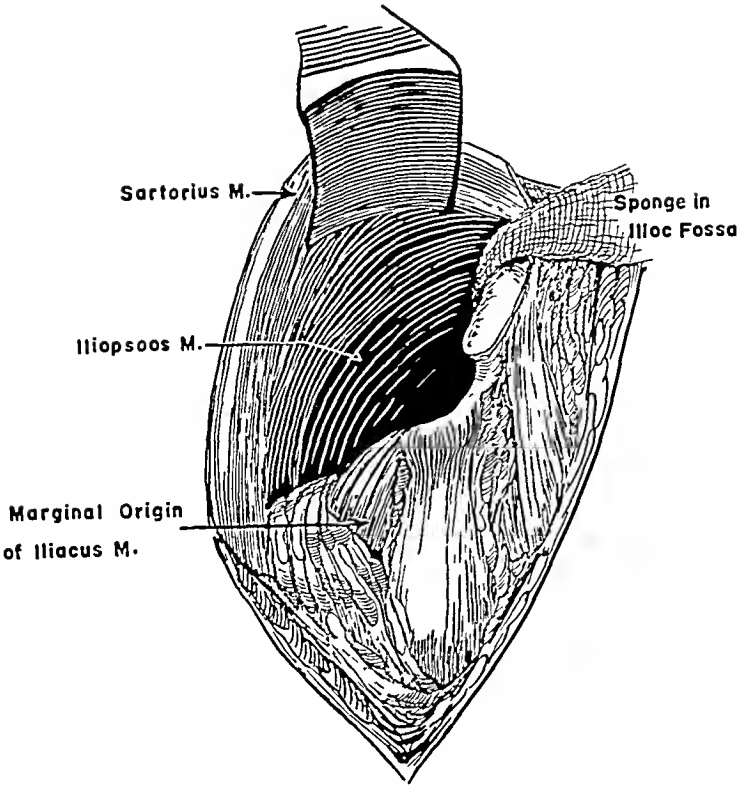
Sartorius M.
Sponge in
Iliac Fossa
Iliopsoas M.
Marginal Origin
of Iliacus M.

FIG. 21

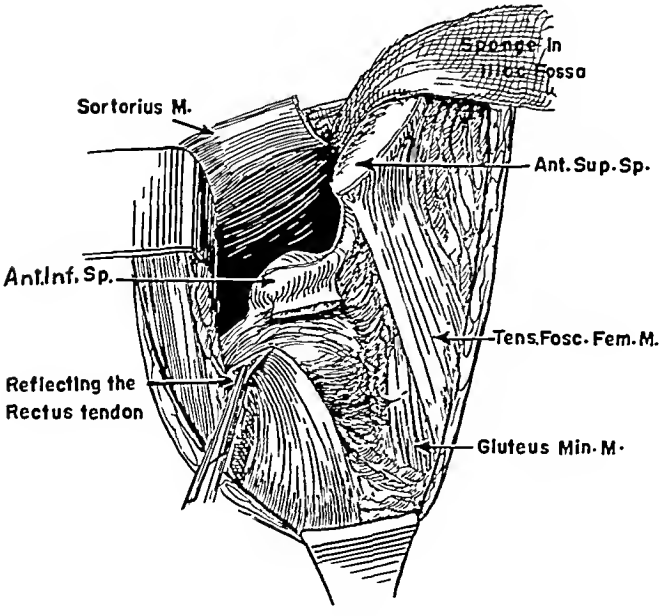
Sponge in
Iliac Fossa
Sartorius M.
Ant. Sup. Sp.
Ant. Inf. Sp.
Tens. Fosc. Fem. M.
Reflecting the
Rectus tendon
Gluteus Min. M.

FIG. 22

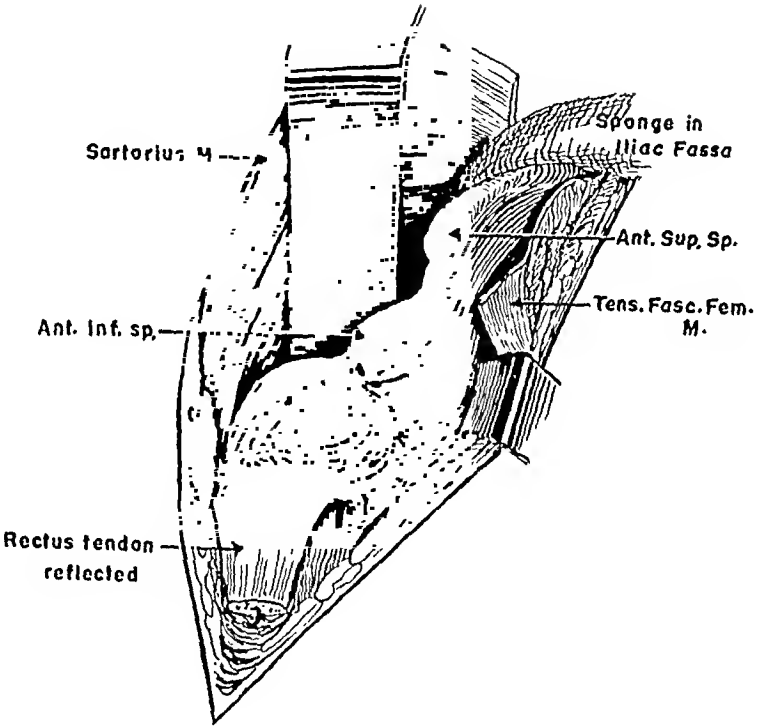
Sartorius
Sponge in Iliac Fossa
Ant. Sup. Sp.
Tens. Fasc. Fem. M.
Ant. Inf. sp.
Rectus tendon reflected

FIG. 23

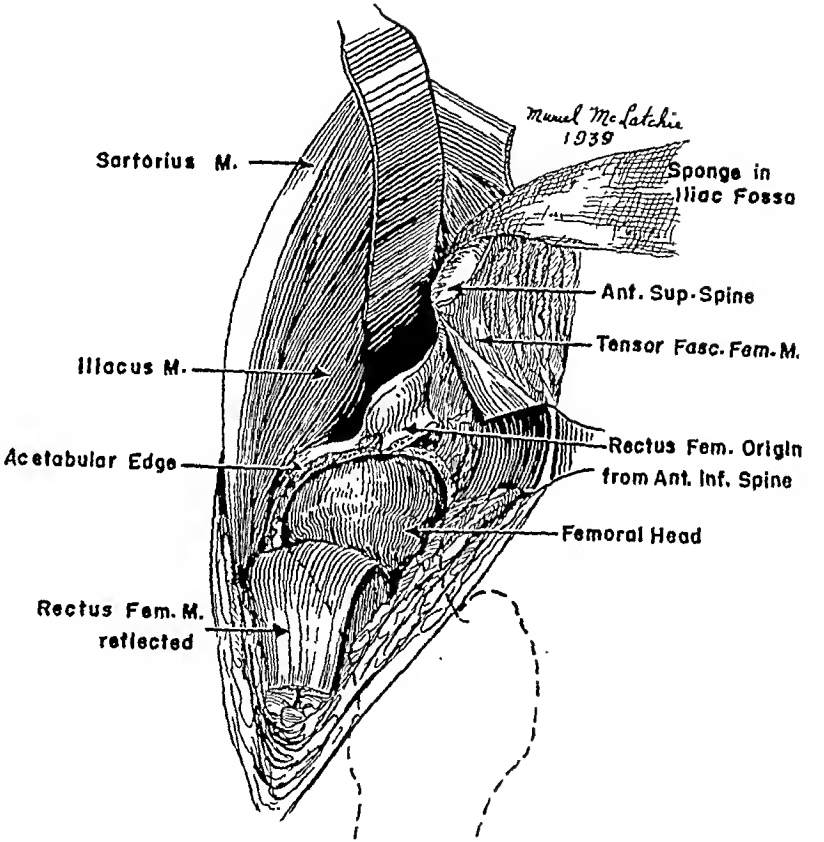
Manuel McLatchie 1939
Sartorius M.
Sponge in Iliac Fossa
Ant. Sup. Spine
Tensor Fasc. Fem. M.
Iliacus M.
Rectus Fem. Origin from Ant. Inf. Spine
Acetabular Edge
Femoral Head
Rectus Fem. M. reflected

FIG. 24

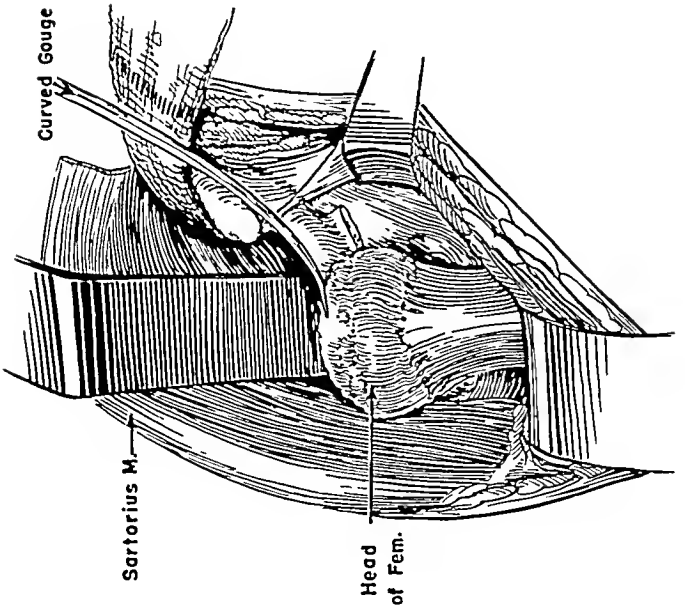
Curved Gouge
Sartorius M.
Head of Fem.

FIG. 26

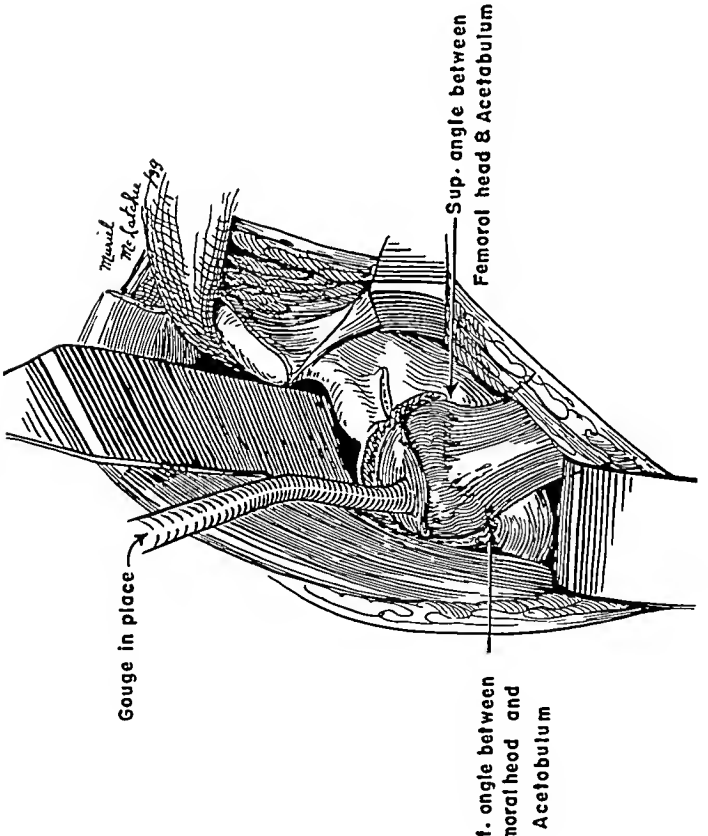
Gouge in place
Sup. angle between Femoral head & Acetabulum
Int. angle between Femoral head and Acetobulum

FIG. 25

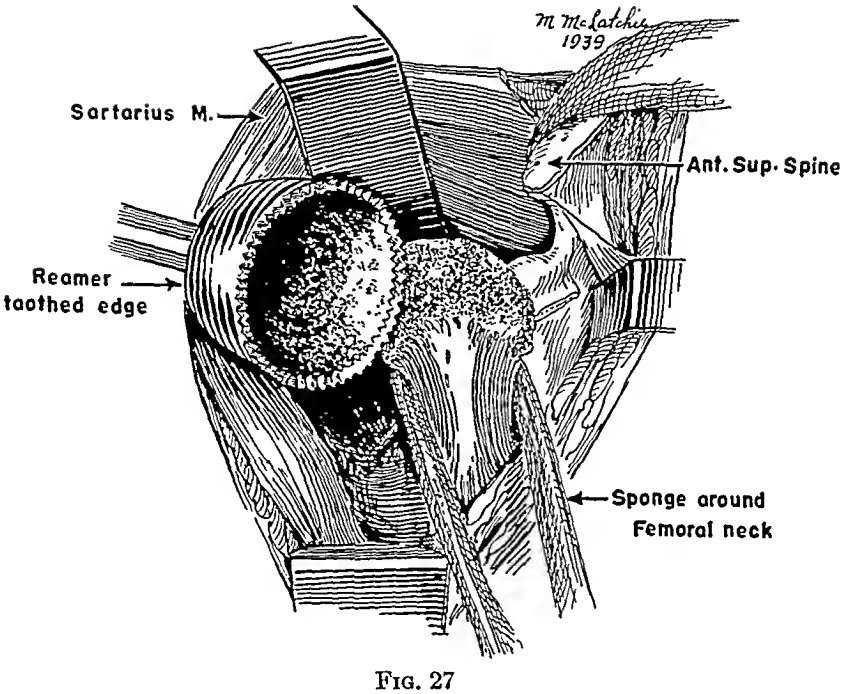

FIG. 27

the anterior inferior spine and reflected from the anterior capsule; it is temporarily sutured to the inferior angle of the incision in order to keep it retracted without traumatization (Fig. 23). At times it becomes necessary to reflect the origin of the tensor fasciae femoris and gluteus medius from the lateral aspect of the ilium in order to facilitate the dislocation of the head of the femur (Fig. 24).

The anterior capsule is excised along with the marginal origin of the iliacus, as well as a portion of the Y ligament (Fig. 25); this exposes the anterior aspect of the joint. In cases of bony ankylosis particular care should be taken to develop the angle between the femoral head and the acetabular margin, both superiorly and inferiorly (Fig. 26). Between these two points it is usually possible to define a sulcus representing the line of fusion between the acetabulum and the femoral head. The osteotomy can then be carried out along this line with the assurance that the new joint surfaces will coincide in location with the original joint surfaces. Special gouges are used for this purpose; they are shaped to correspond to the curves of a normal femoral head.

If dislocation is found to be resisted by the muscles arising from the lateral aspect of the ilium—that is, the tensor fasciae femoris, the gluteus minimus, and the gluteus medius—these may be reflected subperiosteally as already pointed out (Fig. 24).

Any marked bony projection is removed by means of thin, curved gouges (Fig. 26) before the reamer is applied for the final finishing off (Fig. 27). This reamer has a toothed edge, so that it cuts its way around the circumference of the head and neck.

Attention is next directed to the acetabulum; its anterior wall can be

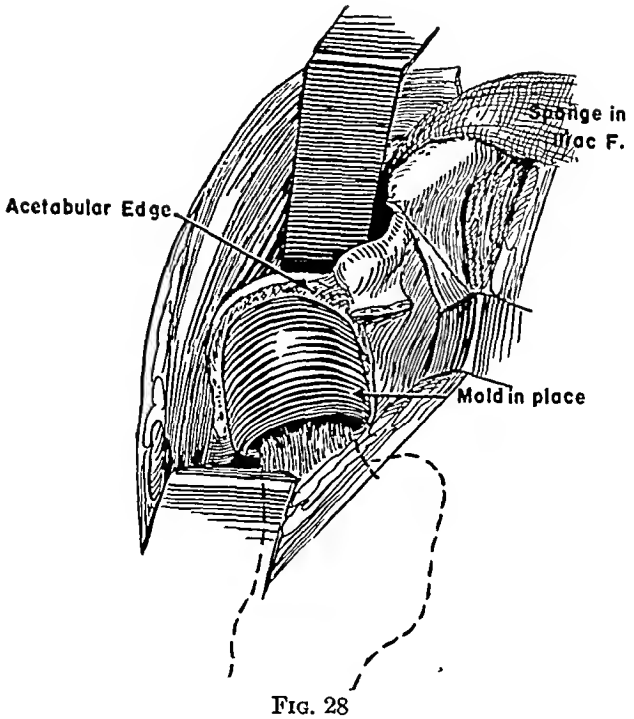

FIG. 28

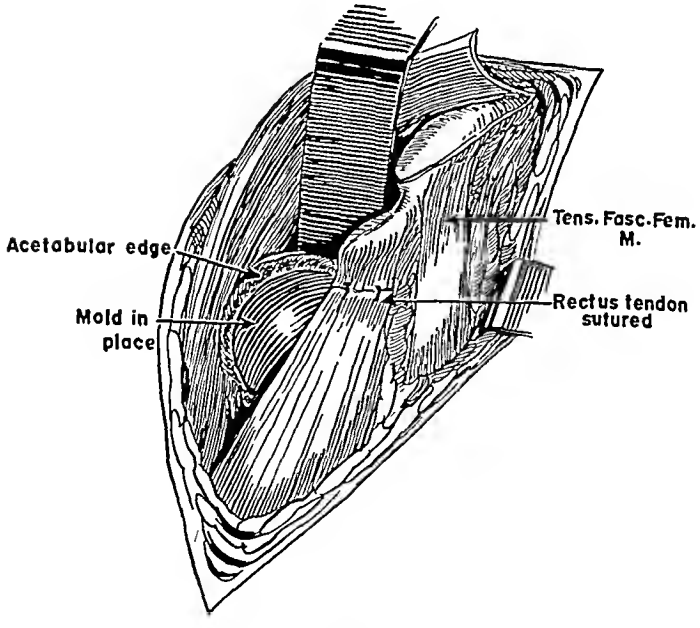

FIG. 29

sacrificed to a considerable extent. By the use of the hip gouges the floor and posterior wall can be made congruous with the surface of the femoral head. Occasionally a male reamer is used for finishing off the surface of the new acetabulum. If the circulation of the femoral head is

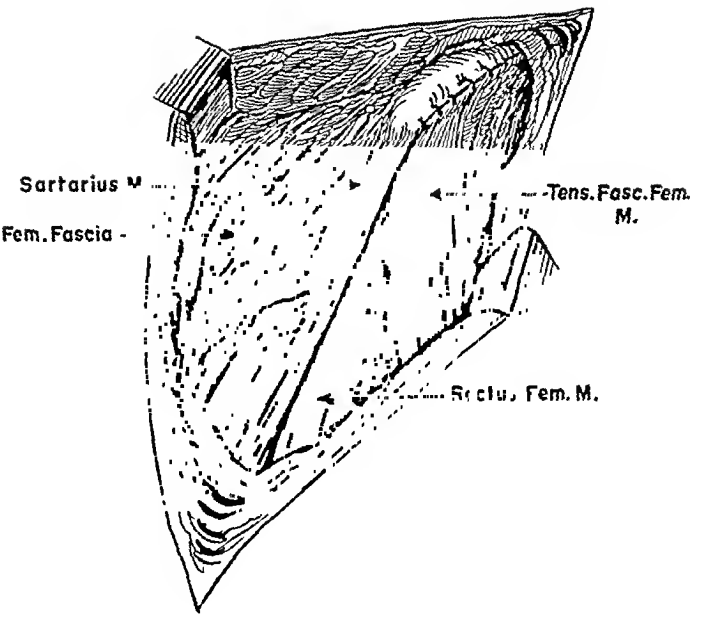

FIG. 30

insufficient, drill holes are made in the direction of the femoral neck. The vitallium mold is then applied (Fig. 28). It should not be fixed to the femoral neck by screws or nails, since by so doing abnormal mechanical conditions are created.

Since the approach follows structural planes, the closure is very simple. The rectus femoris is sutured to its proximal stump (Fig. 29); this brings its posterior tendinous surface in apposition to the femoral neck and to the edge of the mold. Suturing the periosteum of the iliac crest to the origin of the muscles arising from the lateral aspect of the ilium allows the sartorius and the iliacus to drop back over the mesial portion of the joint (Fig. 30).

Points in Operative Technique Deserving of Emphasis

The author wishes to emphasize the following points in the operative technique which his experience has shown to be of importance:

1. The approach must be developed with the utmost respect for anatomical structures. The intrapelvic exposure of the acetabulum is absolutely necessary; it is the exceptional case, however, that requires the reflection of the sartorius from the anterior superior iliac spine.

2. Reflecting the origin of the glutei from the lateral aspect of the ilium facilitates the dislocation of the hip.

3. After excision of the anterior capsule and before dislocating the hip, hypertrophic overgrowth of the head should be removed. This is helpful for two reasons: It facilitates dislocation and it also assures proper alignment of the newly shaped head to the neck. In cases of bony ankylosis it is important to develop the inferior angle, or junction between the neck and the inferior acetabulum, as well as the superior angle, or point of

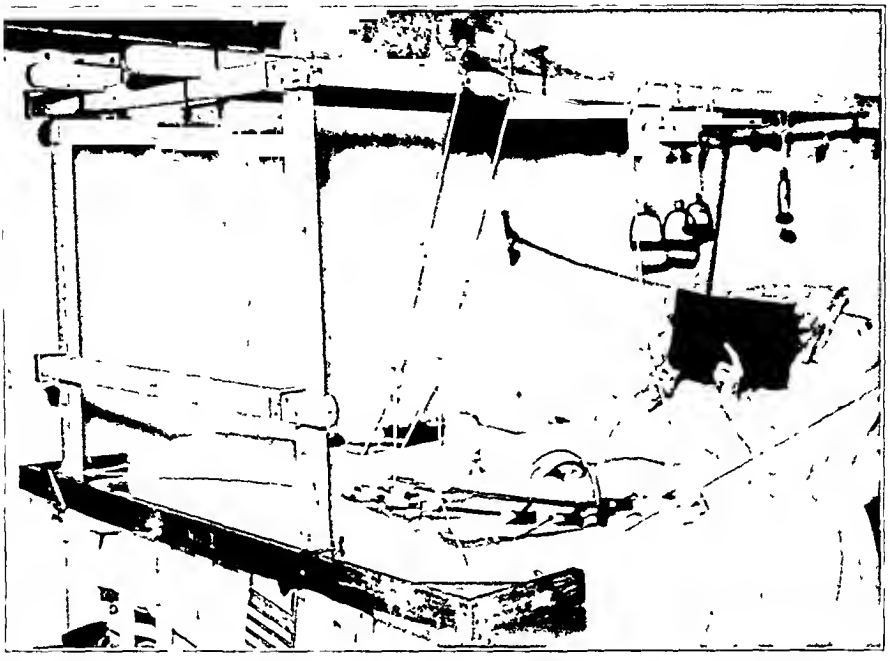

FIG. 31

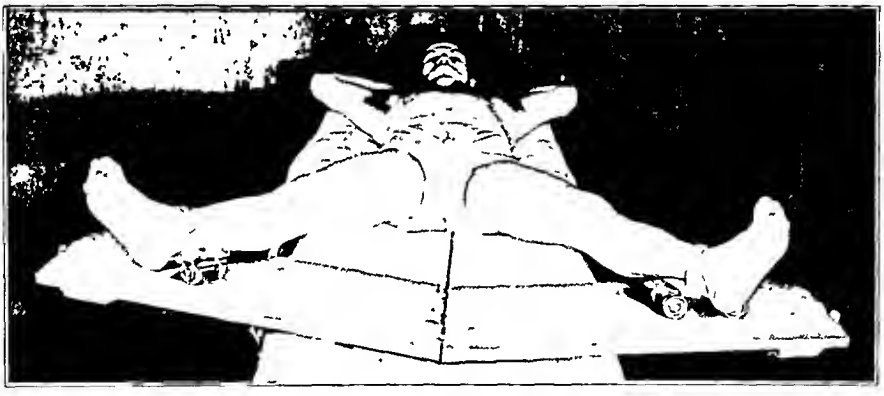

FIG. 32

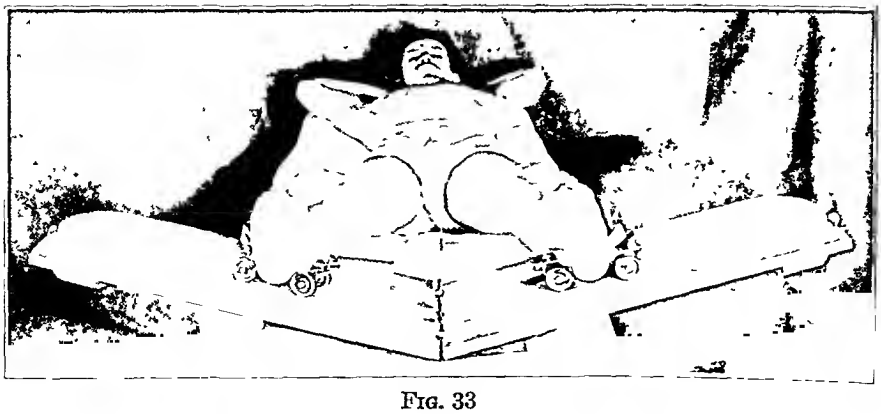

FIG. 33

FIG. 34

FIG. 35

junction between the superior neck and the superior acetabulum. The curved osteotomy between these two points is then bound to be very close to, or actually to coincide with, the old joint line.

4. Sacrificing the anterior capsule and the Y ligament of Bigelow does not weaken the anterior aspect of the joint sufficiently so that dislocations or subluxations occur. So far the author has had no such complications, and in the cases in which he has removed the mold he has always found the necessary dislocation difficult to perform. If the anterior capsule is left intact, it gives rise to excessive scar formation, which limits joint function.

FIG. 36

POSTOPERATIVE TREATMENT

The striking feature in the postoperative course is the relative absence of pain after a decidedly major surgical procedure; even during the first few days the patient is able to move around in bed without discomfort. The operated extremity is suspended in a Hodgen splint with a Pearson attachment (Fig. 31). The suspension is so arranged that the patient can give himself assistance in performing active exercises in all directions, as far as both the hip and knee are concerned.

At the end of the second week roller-

skating exercises are started (Figs. 32 and 33). The roller skates are strapped on the back of the legs, just above the ankles, and a hinged platform is placed on the bed, furnishing a smooth surface for the roller skates. This arrangement allows the patient to exercise the abductors and adductors with a minimum amount of effort. As muscle strength increases, the wings of this platform are raised, thereby increasing the resistance to abduction; this inclined plane also has the desirable effect of adding motion in flexion. By raising the middle of the platform, so that the wings slope downward, abduction in extension is obtained. These exercises are carried out twice a day. Except for these exercise periods, the extremity is kept in the traction-suspension arrangement for at least four weeks.

In approximately four weeks the patient is allowed to sit up in a chair. As a rule, he is able to exercise on a stationary bicycle (Fig. 34) sometime during the first week out of bed. At first the range of joint motion is insufficient to allow him to push the pedals through a complete revolution, but see-sawing back and forth is very beneficial, and within a week's time he is usually able to make a complete revolution. This accomplishment is almost always accompanied by marked encouragement on the part of the patient and, consequently, improvement in gait. By gradually raising the seat of the bicycle, motion in extension of both hip and knee is increased; similarly, by lowering the seat, additional motion in flexion is obtained (Fig. 35).

Training the patient to use crutches after a long period of recumbency is always difficult. This is greatly facilitated by the use of a walker (Fig. 36). Goose-stepping should be emphasized, as the patient always has a tendency to favor the hip by bending the knee.

During the hospital stay the patient is also instructed in specific exercises for flexion, extension, abduction, and internal rotation. After discharge these exercises are kept up indefinitely; whenever possible exercising on a stationary bicycle is continued for a period of months. Crutches are used on the street for a minimum of six months; in the house, the patient frequently gets along with a cane in as short a period as two months after operation.

SUMMARY

The method of arthroplasty described is based on a new principle,—that of interposition of a mold by which nature can do its repair work; this mold is removed at a secondary operation, leaving congruous joint surfaces, which are capable of function because their covering approximates normal cartilage. Even though this two-stage mold arthroplasty has been proved practical, present indications are that the "mold principle" should be abandoned; if this be true, the mold becomes a permanent insurmountable barrier to recurring ankylosis.

No end results can be reported, since the twenty-nine patients in whom the vitallium mold has been used have all been operated upon since June 1938. The very fact that we have felt justified in doing as large a

series as this in a relatively short period of time points to the success of the method during the first few months. Furthermore, the experience gained from the use of the glass molds has given us confidence in the soundness of the method.

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FISSURE FORMATION IN ARTICULAR FACETS OF THE LUMBAR SPINE

Operative Findings in One Case

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From the Crippled Children Hospital, Marlin

The purpose of this paper is to add to the literature six new cases of this peculiar anomaly of the lumbar facet and to report operative findings in one case, as a careful review of the literature reveals that no case of this type has ever before been operated upon or studied at autopsy. The only opinions as to the etiology of this anomaly have been based primarily on the roentgenographic findings, but in the case here reported the author was able to study the anomaly grossly and microscopically, and this additional knowledge throws more light on the possible origin and development of these facet anomalies.

In 1929, Michajlow and Tscherepnina, in a paper presented before the Moscow Society of Radiologists, described certain gaps in the continuity of the articular processes of the lumbar spine. This is probably the first written recognition of the lumbar-facet anomalies to be discussed here.

In 1931, Reisner reported one case which he thought was due to an accessory articular process.

In the same year, Müller also described the same type of roentgenographic finding, but he explained the presence of the gap formation on the basis of "*Umbauzonen*" or an absorption of bone along a line of previous trauma. Later in the same year, however, in another publication he decided that this gap formation in the articular processes must be due to an accessory articular process.

Litten, in 1932, reported three cases of gaps in the articular processes of the lumbar spine. He discussed the embryological development of the spinal column, and his explanation of the fissure formation was that accessory bone nuclei did not become attached or were not absorbed, so that a disturbance of ossification resulted.

Also in 1932, Nichols and Shiflett described this vertebral anomaly and presented seven cases. In the discussion of their cases they decided that these anomalies must be ununited anomalous epiphyses of the articular processes.

In 1933, Rendich and Westing reported six cases with identical roentgenographic findings, but they concluded that the anomaly represented an anomalous accessory bone of the spine similar to the os trigonum in the ankle.

In 1934, Fulton and Kalbfleisch reported two cases and thought that the gap was probably due to an accessory articular process.

Farmer, in 1936, reviewed forty cases of this anomaly and called it a congenital anomalous accessory articular process.

In 1937, Bailey, of Los Angeles, reported ten cases.

In reporting his six cases, the author will describe in detail only the one case in which the patient was operated upon. The first five cases are summarized in Table I, and the roentgenographic appearance of each is very much like that of Case 6 shown in Figure 1. In each of the first five cases the finding of the accessory ossicle was merely incidental to the examination of the patient, and it was recognized as an ossicle.

CASE REPORT

Case 6. R. D., colored male, aged twenty-four years, entered the hospital two hours after he had sustained an injury to his back. He had fallen backward into a large hole in the ground, and had received a hyperextension type of injury, producing immediate pain in the mid-lumbar spine. This pain was exaggerated with motion and was partly relieved by rest.

Fig. 1

Case 6. Showing fissure formation across tip of facet.

Examination revealed point tenderness over the second and third lumbar spinous processes, limited and painful motion in this region, and an area of hypersensitiveness with cotton-tuft testing over the distribution of the third lumbar nerve on the right thigh and to the right of the mid-line of the spine at this level for a distance of about three inches.

Roentgenographic examination was negative except for the accessory ossicle found at the lower tip of the inferior articular process of the third lumbar vertebra on the right side. (See Figure 1.) This finding was not interpreted as a fracture, but was recognized as an accessory ossicle; yet it was concluded that, since it was an anomalous bone, it could be a point of mechanical weakness and, therefore, might be more easily injured than a normal articular process. Because of the definite point tenderness and the nerve findings, it was concluded that an injury had occurred at the site of this anomaly, the exact nature of which, however, was somewhat obscure.

The patient was treated conservatively with a plaster jacket for eight weeks. On removal of the plaster, tenderness was still present over the third lumbar spinous process, as well as limited and painful motion with the same area of nerve involvement as previously found.

Physiotherapy was tried for three weeks, with no improvement; it was then decided to operate upon the spine.

Operative Findings

At operation, the accessory ossicle was found to be present at the lower tip of the right third lumbar articular process. The posterior surface of this bone was depressed below the level of the adjacent facet surface. There was a fibrous thickening between the borders of the facet and the depressed ossicle, as if definite ligaments or a capsule had

been present and had been torn with subsequent thickening in the reparative process. The ossicle was loose and slipped up and down (anteroposteriorly) about one-quarter of an inch with manipulation before the ligaments were cut away and the bone removed. The ossicle was removed by holding it with Ochsner forceps and pulling backward. It came out with very little difficulty, leaving a deep wedge-shaped hole with its greatest length in an anteroposterior direction. The anterior end of this bone, therefore, lay near the nerve-root foramen. The adjacent margin of the lumbar facet was lined with a smooth, glistening, gray, thin cartilage resembling in every way the cartilage of a normal weight-bearing joint surface.

After removal of the accessory bone, the incision was closed. A plaster was not applied. The pain cleared up completely in two weeks. The patient has since returned to work and has had no recurrence of the pain over a two-year period.

GROSS DESCRIPTION OF OSSICLE

Figure 2 shows two views of the ossicle. On the left is a lateral view. The right end of the ossicle was directed posteriorly or dorsally; the left end, anteriorly or ventrally. The roughened appearance of the right end is due to some crushing of the bone by the Ochsner forceps. The superior surface was in contact with the lower margin of the facet above.

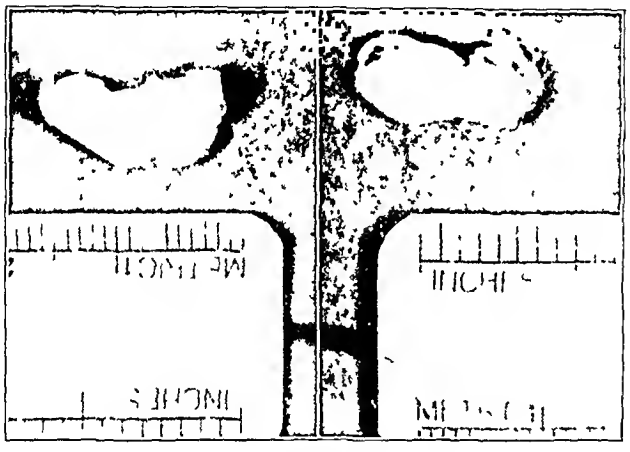

FIG. 2

Case 6. Showing removed ossicle.

On the right is a view of the inferior surface of the ossicle, Here also the right end of the ossicle was directed dorsally or posteriorly.

The entire surface of this ossicle was covered with a thin, gray, glistening cartilage, resembling normal joint cartilage except for the posterior end, which was slightly rough in appearance and was the attachment surface for the fibrous capsular tissue extending between the ossicle and the facet.

MICROSCOPIC APPEARANCE OF OSSICLE

The ossicle was a small mass of cancellous bone surrounded on all sides with hyaline cartilage. The cartilage lining the bone was identical in appearance, except for that on the side of the bone which lay adjacent to the inferior surface of the facet above. This superior surface of the ossicle was also lined with cartilage, but its cellular arrangement was different, the matrix stained differently, and the basal line was more irregular.

Surface of Ossicle not in Contact with Facet Above (Fig. 3)

This surface of the bone was covered with a normal-appearing

hyaline cartilage resembling in every way the hyaline cartilage of a normal weight-bearing joint. The base line between cartilage and bone was relatively smooth. A thin line of dense-staining cells lay immediately adjacent to the bone. Just away from this were present normal-

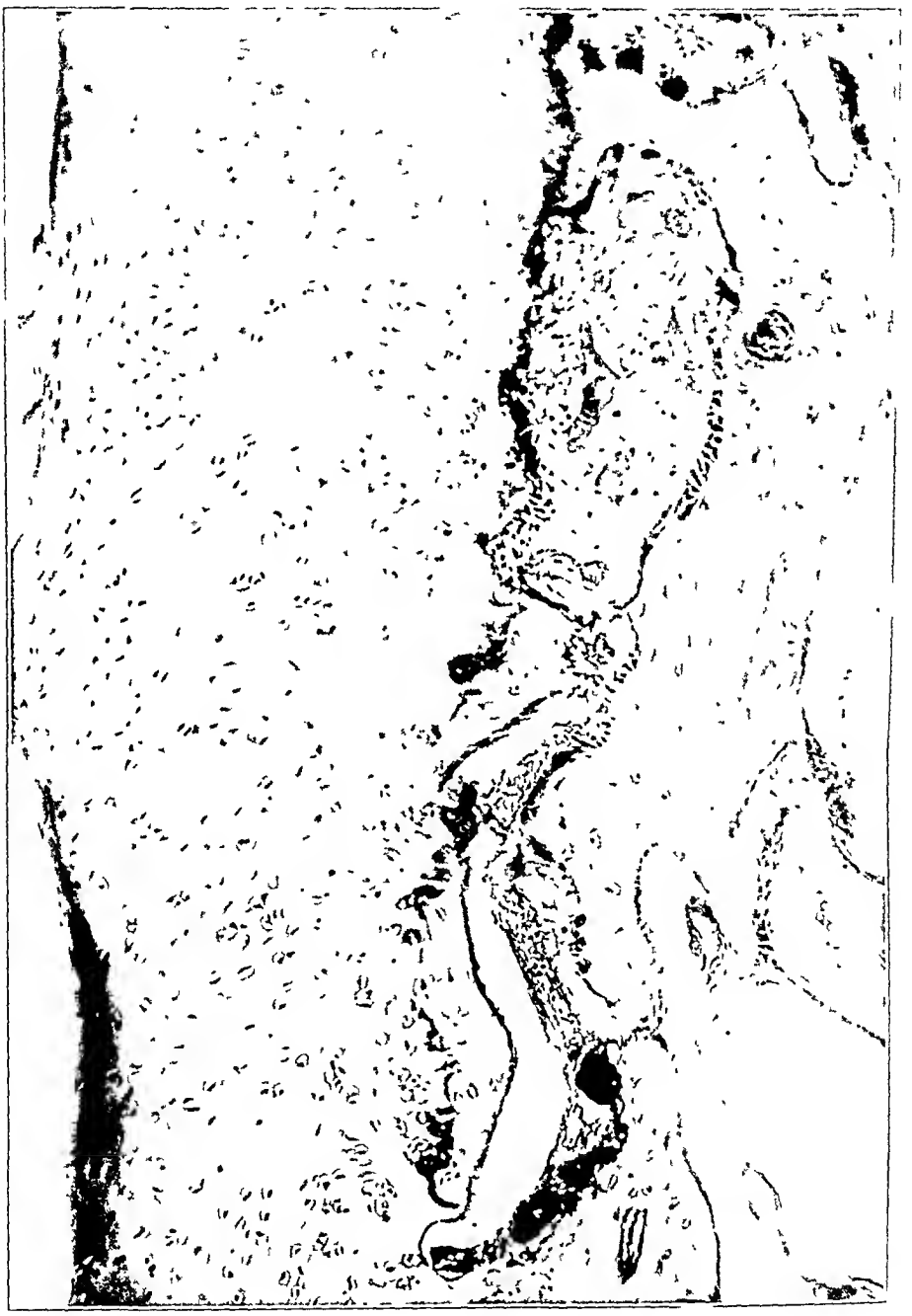

FIG. 3

Case 6. Microscopic section of cartilage lining ossicle on side opposite the fissure line.

appearing hyaline-cartilage cells lying in laeunae, some singly, but mostly in pairs. They were distributed rather homogeneously through the matrix, and the matrix itself was smooth and homogeneous and stained uniformly throughout. The cells, however, became smaller farther away from the bone, tended to lie parallel to the bone and perichondrial sur-

FIG. 4

Case 6. Microscopic section of cartilage lining ossicle on fissure line.

face, and lay singly more often than in pairs. Approaching close to the perichondrium these cells became definitely flattened and parallel to the overlying perichondrium. The perichondrium was rather smooth and stained evenly.

Surface in Contact with Facet (Fig. 4)

This surface of the bone was also covered with hyaline cartilage. The base line, however, was very irregular and in places was imperceptible, the gradation between bone and cartilage occurring so gradually that a definite darker-staining basal zone was often absent. In certain areas the bone bulged upward into the cartilage, and in other places the underlying bone included a tongue-like cartilaginous area, which, however, seemed to be undergoing calcification. There were more and larger blood spaces on this side of the bone than on the opposite side. Away from this irregular base zone the cartilage cells appeared in groups or nests, there being from twelve to twenty cells in each nest. Each nest was surrounded by uniform dark-staining matrix, but the matrix of the nest itself was lighter in its staining capacity and was not so smooth and uniform throughout. Toward the periphery of the cartilage occasionally free cells were found singly and in pairs, but for the most part no cells occurred that were not in cell nests. A perichondrium was present, but it was much thinner and less distinct than on the opposite side of the bone.

Because of the dissimilarity of the cellular arrangement of the hyaline cartilage covering the two surfaces of the ossicle, an attempt was made to find out just what the significance of this variation might be.

Careful study of several texts on histology failed to give much light as to differences in hyaline cartilage of the various structures of the human skeleton. Therefore, sections of bone with its overlying hyaline cartilage were made and studied. These studies revealed several differences that were rather uniform in the limited number of available specimens examined.

The sections for study were from sesamoid bones, normal joints, and epiphyseal lines of growing bones removed in the course of epiphyseal-arrest operations in poliomyelitis cases. Sesamoid bones presented a smooth homogeneous cellular arrangement of the hyaline cartilage like normal joint cartilage, although it was even more smooth and regular than the joint specimens studied, and more smooth than either side of the ossicle in question. Normal joint cartilage had a cellular arrangement very much like that on the surface of the ossicle not in contact with the facet above. The basal zone was smooth; the matrix stained evenly; there was no inclusion of cartilage in the bone area, nor bone in the cartilage area; and the cells were rather uniform in size and distribution. However, sections taken from epiphyseal cartilage in growing children showed the following characteristics: The basal zone was irregular; the

matrix stained more irregularly than does other cartilage; and some of the cells lying close to and in the basal zone were larger in size than the remainder of the hyaline cells visible in the section. Small areas of cartilage inclusions in the bone, which took a deeper stain and were apparently undergoing calcification, could be seen. There was some tendency for the cells to group themselves into nests, although this was not so marked as in the ossicle surface that lay in contact with the facet margin.

The points of similarity, however, between this ossicle surface and the sections studied from growing epiphyseal lines are many. Both have irregular basal zones; both have a matrix that does not stain homogeneously; both have a tendency for the cells to be grouped into cell nests; and both have inclusion areas in bone and cartilage of the opposite tissue. These characteristics are not found in any other type of hyaline cartilage from human-body sections studied.

This comparison of different hyaline-cartilage sections, therefore, leads us to believe that this ossicle most likely is an epiphyseal structure that is not yet united or is in an ununited state. There is a marked similarity in the cellular characteristics of known epiphyseal cartilage and the cartilage lining this ossicle on its superior surface, which is in contact with the facet tip above and forms the visible gap or fissure in the facet structure.

ETIOLOGY

Other authors have contended that these anomalies represent "*Umbauzonen*", ununited fractures of the facets, accessory ossicles of the facets, or ununited anomalous epiphyses of the articular facets. For the sake of completeness, the author believes it would be wise to include also in this list, sesamoid bones and the possibility of a normal ossification center that has not united, instead of assuming that if it is an epiphysis it is an anomalous one that has failed to unite.

Müller's original opinion that these anomalies were due to "*Umbauzonen*" is not now tenable and has been refuted by the author himself. That this explanation will not fit is easily seen when one notes in Figure 4 that this fissure formation is a cartilaginous line, composed of hyaline cartilage, and the bone changes which one would expect to find with "*Umbauzonen*" are not present.

Ununited fractures of the articular facets may resemble this anomaly, as Koch pointed out, but the microscopic picture of the removed ossicle definitely shows in this case that a fracture did not exist, and a definite anomaly of some kind is present.

Sesamoid bones are always embedded in a tendon. This ossicle did not lie in a tendon; it was not surrounded by tendinous tissue; there is no tendon in this part of the spine large enough for it to be encapsulated in; and it had no gliding action over another bone, which is the reason for the development of most sesamoid bones in tendinous tissue. A com-

face, and lay singly more often than in pairs. Approaching close to the perichondrium these cells became definitely flattened and parallel to the overlying perichondrium. The perichondrium was rather smooth and stained evenly.

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already present as an independent piece of cartilage in the embryo in the second month, and that the condition thus arising early in embryonic development is practically always bilateral. Köhler, Pfitzner, and others likewise believed that the accessory bone, os trigonum, is present in early embryonic life as an independent piece of precartilage, and, regardless of whether these accessory ossicles occur in the ankle or in the spine, they can be expected to be bilateral in the vast majority of cases. This is not true of these anomalies in the lumbar spine, since reference to Table I shows that in only seven out of thirty-six cases was the condition

FIG. 5

Illustrating common type of sclerotomic maldevelopment.

bilateral, which is too low a percentage to compare with the very high percentage of bilaterality of true accessory bones. It is not likely, therefore, that these anomalies of the facets in the lumbar spine can be classified as true accessory bones.

Since this anomaly is most likely to be an intrinsic form of vertebral maldevelopment, a study of the stages of vertebral development may be of some help in determining its origin.

The spine develops from the sclerotomes of the primitive segments. The sclerotomes at about the third week of development form themselves into two sections,—a dense caudal part and a more loose cephalic part. The denser tissue of the caudal part of each sclerotome forms most of the body of the vertebra, but the cephalic portion of each sclerotome becomes associated with the caudal part just below; thus each vertebra is derived from parts of two adjacent sclerotomes. This developmental peculiarity leads to a multiplicity of possibilities for developmental abnormalities. Changes suggestive of sclerotomic maldevelopment, however, most often involve the body of the vertebra and seldom the processes alone. Figure 5 shows a vertebral modification characteristic of a sclerotomic maldevelopment; changes such as this occur not only in the lumbar spine, but also in the cervical and thoracic spine. These facet anomalies have not been reported anywhere except in the lumbar spine and also involve only the facet tips. It does not seem plausible, therefore, that the development of these fissures in the facets could be accurately traced back to a sclerotomic stage of development.

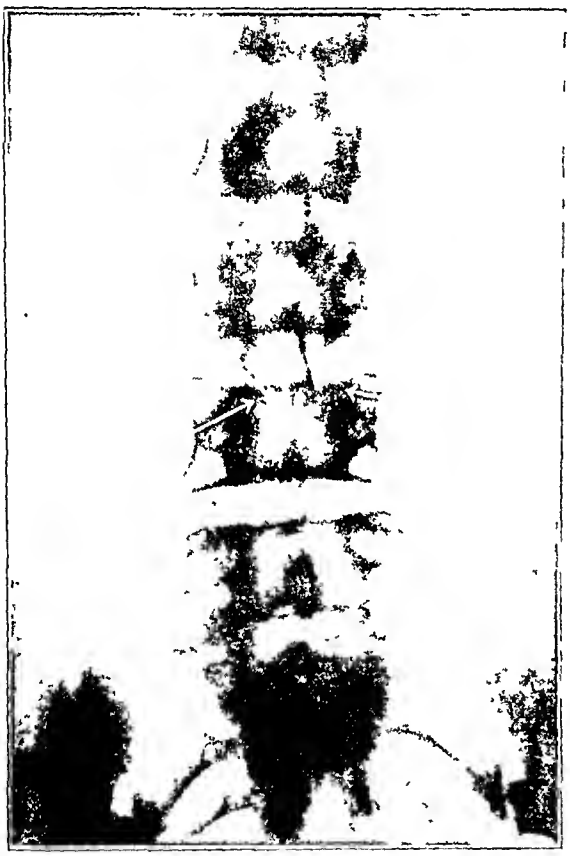

FIG. 6

Fissure formation at base of facets.

Another possibility that must be discussed lies in a consideration of the developmental changes that are characteristic of the lumbar vertebrae themselves, since these anomalies seem to be peculiar to the lumbar region. The transverse process of the lumbar vertebra is the homologue of the rib of the thoracic vertebra. The mammillary and accessory

processes of the lumbar vertebra are the homologue of the transverse process in the thoracic spine. The mammillary and accessory processes lie near the base of the superior facet or in the articulated spine; they also lie near the tip of the adjacent inferior facet. If, therefore, these two processes should unite with each other, but fail to unite to the adjacent bone, they would give a roentgenographic appearance almost identical with that of the anomalies under discussion. If this should be true, it is difficult to explain the presence of the normal mammillary processes distinctly visible in some of the roentgenograms where this ossicle is present; also there would hardly be the variation in size that is present in these ossicles, as they should all be rather small to correspond with the diminutive size of the mammillary and accessory processes themselves.

This review and discussion of the embryological stages of development of the vertebra has rather conclusively shown that the origin of these facet anomalies must lie not in a maldevelopment of the vertebra at an earlier embryonic stage, but at a later stage when ossification centers are appearing and forming. This probability is further borne out by the appearance of the hyaline cartilage covering one surface of the removed ossicle, since its characteristics were those of known epiphyseal cartilage.

Since it does seem conclusive that this ossicle anomaly is part of an epiphyseal structure, it must now be determined whether it is an anomalous or an accessory epiphysis for the articular process or whether it is simply a variation of development of a normal epiphysis that is normally present in every spine.

In most of the available texts on embryology there is no mention of the possibility of there being an accessory or anomalous epiphysis for the lower tips of the articular facets. McMurrich, however, states that secondary centers of ossification appear at puberty in the cartilage at the tips of the articular processes, and that these epiphyses remain separate until growth is complete and between the sixteenth and twenty-first years unite with the bone from the primary center. Willis, in a review of 1471 skeletons for vertebral anomalies, did not mention the possibility that this anomaly might occur. Bailey and Miller state that a secondary center of ossification does appear on the tip of each articular process in the lumbar vertebra, but in the accompanying illustration is shown the secondary center for the mammillary process which lies at the base of the superior facet of the lumbar vertebra.

A review of sixty-two roentgenograms of spines of children of ages between puberty and twenty-one fails to reveal the accessory epiphyses mentioned by McMurrich. It is, therefore, most likely that these separate epiphyses at the tips of the facets are not a uniform finding. If it is true that they are uniformly present in the spine as normal growth phenomena, then it would be reasonable to assume that these centers would fail to unite in the thoracic region just as regularly as in the lumbar region, which apparently is not so. The author thinks that it may be

possible for an anomalous accessory epiphysis to be present at the tip of an articular process, and, being present, it is also possible that it could fail to unite, but it is not probable.

Figure 6 shows another developmental defect. This is very similar to the smaller ossicles in question with a fissure line across the base of the facet, separating the entire facet from its pedieulolaminar base, instead of a fissure line lying across the extreme tip of the facet.

There is a normal primary center of ossification in the neural arch that first forms in the embryo at the base of the articular process at about the third month of development; from this center, ossification spreads upward and involves the entire neural arch with the exception of the spinous process and the transverse process, which form from separate centers. From this same normal ossification center at the base of the articular process, ossification proceeds downward to involve the lower part of the articular process. Therefore, Figure 6 simply shows a failure of fusion of this normal primary ossification center. Ossification from this center has spread upward to include the lamina and downward to involve the lower part of the facet, but this center itself has simply failed to unite. This case, therefore, shows simply a failure of a normal-appearing ossification center to fuse, rather than an accessory center that has failed to unite.

The roentgenographic appearance of this spine differs from those in the other reported cases only in the size of the ossicles themselves or in the location of the fissure line. Here this line is at the base of the facet; in most of the others, it lies near the tip of the articular process.

It seems quite logical, therefore, to assume that these facet anomalies represent a failure of fusion of a normal-appearing ossification center in the neural arch. Some of the ossicles reported are rather large; some are rather small, as is the one reproduced in Case 6; but this variation in size can easily be explained by a more rapid growth of the ossification process cephalad than caudad in some cases, producing an apparent or actual migration of this normal center away from the base of the facet. The same disturbing element that causes the failure of fusion could also bring about the uneven rate of ossification on the different sides of the center. Ununited epiphyses are quite common, while anomalous epiphyses are uncommon, and it stretches the imagination still further to assume that an anomalous epiphysis having appeared has failed to unite. This explanation fits all of the facts of the case, and it will suffice regardless of whether the ossicle is on the inferior or the superior facet.

ANALYSIS OF THE REPORTED CASES

Analysis of the thirty-six cases presented in Table I shows the following facts.

In seven cases (19.4 per cent.) the anomaly was bilateral; in twenty-nine (80.5 per cent.), it was unilateral. These anomalies are more often present on the right side than on the left in the ratio of 21:8. The su-

perior facet was involved only twice (5.5 per cent.) in these thirty-six cases. There was complete separation of the facet continuity by this fissure in all but two out of the thirty-six cases, or incomplete separation in 5.5 per cent.

The first lumbar vertebra was involved twice, or 5.5 per cent.; the fourth lumbar, once, or 2.7 per cent.; and the second and third, about equally, with seventeen and sixteen cases respectively.

There were five females and thirty-one males. This seeming sparsity of findings in the female is probably due to the facts that more men injure their backs in heavy labor; and that back pain in women is almost never conceded, by the practitioners who see them first, to be due to anything but some intrapelvic pathology, and roentgenograms of the spine are not, therefore, so often made.

In the column "Associated Back Pain", in those cases listed as "Yes", there was some type of back pain that might possibly have been associated with the anomaly found. In those listed as "None", either no pain referable to the spine was present or, if present, this pain was easily explained by other significant findings in a different section of the spine.

Analysis of this group, therefore, shows that nineteen out of the thirty-six patients had no back pain which could be attributed to this anomaly; while sixteen had pain in the spine that may or may not have been associated with this roentgenographic finding. In one of the cases reported by Rendich and Westing, it was not clear whether or not back pain was present.

Farmer, of Cleveland, presented a summary of forty cases which he had seen, and the ratio of involvement of the inferior and superior facets, of the right and left sides, and of males and females, etc., is almost identical with the percentages gleaned from the summary of the literature presented in this discussion and in Table I.

CLINICAL IMPORTANCE

The chief clinical value of these anomalies lies in their recognition as such and in their differentiation from fractures of the articular facets. Articular-facet fractures do occur and are often overlooked, due probably to poor detail in roentgenographic technique, but the picture in cases where fracture has occurred is different from that presented by these facet anomalies. These anomalies show a smooth margin on each side of the fissure, and there is a line of cortical condensation on either side of the smooth fissure, which is not seen in facet fractures. No displacement is present in these anomalies; whereas it most often is present and distinctly visible in the oblique views in cases where fractures have occurred. Mitchell published reports of cases of facet fractures, in two of which operations had been performed, and fibrous union only was found between the fragments. The roentgenograms of his cases in which operations were performed, and of those in which complete relief was

not obtained by conservative treatment, show definite irregularity of the gap formation and some displacement of the fractured tips. It is significant, however, that in his Case 3 the patient obtained complete relief in one week, following the application of a back brace; there was no recurrence of symptoms; and examination of the roentgenograms in this case shows no displacement of the facet tip and a smooth linear fissure with definite cortical thickening present on either side. It is possible, therefore, that this one case could have been misinterpreted as a fracture and was actually a facet anomaly. This only shows, however, the importance of recognizing clinically and roentgenographically the presence of these anomalies, as they can easily be mistaken for facet fractures.

Another important clinical observation is brought out in the presentation of the operative findings of the case described in this paper. Although the anomaly may be recognized as such, there is still the possibility that this anomaly is producing symptoms, due to some displacement of the position of the lower tip of the facet below the fissure that is not recognizable in the roentgenogram. This anomaly may not be the cause of back pain in every case in which it is present, but, because of its abnormal structure, it may be a seat of lessened resistance to trauma, and, therefore, it may be more easily injured than would a normal articular facet.

SUMMARY

1. In the case presented, the operative findings definitely show that the anomaly itself was the cause of the patient's low-back pain.

2. Microscopic and gross studies of this anomalous bone show that it is not a fracture nor the result of "*Umbauzonen*", but that it is a definite developmental abnormality, epiphyseal in character.

3. Embryological study reveals the probability that these anomalies represent a failure of fusion of one of the normally present primary ossification centers lying at the base of the articular facet, and they probably are not anomalous ununited epiphyses or accessory bones.

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ARTHROGRAPHY IN CONGENITAL DISLOCATION OF THE HIP

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At the Orthopaedic Clinic in Stockholm we are at present engaged upon a follow-up examination of the cases of congenital dislocation of the hip in which reduction was carried out during the period from 1913 to 1932. The examination is not as yet concluded, but later results seem to be worse than had been expected. As a step in the attempt to find out a method of treatment which will give better results, anatomical studies of the hip joints have been made with the help of arthrography. Since 1937, we have made arthrographic examinations which we consider to have been most useful, as the picture gives such important information as to the state of the joint. Consequently, we now make such an examination in practically every new case of congenital dislocation.

From the ordinary roentgenographic examination of the hips of a child with congenital dislocation one unfortunately gets no information in regard to the cartilage of the head or of the acetabulum, the extent and shape of the synovial membrane, or the presence of the ligamentum teres. The arthrogram gives definite data about many of these important details, but, in spite of that, hip-joint arthrography has evidently not gained much ground. The author proposes, therefore, to point out its possibilities more in detail.

Both the method of injection and the interpretation of the roentgenograms have provided subjects for a number of articles by many authors. Quite a number of contrast media, both positive and negative, have been suggested. The injection of air or oxygen certainly gives good pictures, but this procedure is unsatisfactory as the gas must be absolutely free of impurities. Iodipin and similar contrast media require a rather coarse needle, and they remain in the joint for a long time. A thinly flowing, easily absorbed contrast medium gives better results. It makes little difference which of the long list of such preparations is chosen, for, if the injection is carried out properly, good pictures will be obtained. We use Bayer's special perabrodil preparation for joints. It is called perabrodil "*zur Gelenkdarstellung*". Each ampoule contains three cubic centimeters of 35-per-cent. perabrodil. To avoid the possibility that the contrast medium may cover, for instance, a small epiphyseal nucleus as a result of density, the original solution is diluted with an equal quantity of normal saline, so that the liquid contains 17.5 per cent. perabrodil.

The method used at our Clinic is as follows: The needling of the hip joint is performed from the front with a fine, rather short-bevelled lumbar needle. The needle is inserted just below Poupart's ligament, about one

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centimeter laterally from the femoral artery. The actual needling is done posterolaterally from the artery toward the empty acetabulum. When the needle point has touched the acetabular surface, it is withdrawn a few millimeters, and the stilette is removed. If the point of the needle is in the correct position, the injection meets with very little resistance. The resistance, however, increases little by little as the synovial membrane is filled. As a rule, from three to three and five-tenths cubic centimeters of diluted contrast fluid are sufficient for the joint of a child up to three years of age. For adults, larger quantities are, of course, used. Before the exposure is carried out, a few rotary movements of the leg are performed, so that the contrast medium will be equally distributed in the joint.

It is possible to perform arthrography under local anaesthesia, but, as reduction takes place simultaneously with arthrography, the whole operation is done under general anaesthesia. Even in other cases a local anaesthetic should be restricted to adults, for children are easily frightened, and consequently a general anaesthetic is nearly always employed.

If an arthrogram of both hip joints is desired, injections are made simultaneously on both sides in order to waste as little time as possible. The perabrodil is absorbed so quickly that the pictures are soon blurred.

When the arthrograms have been taken—usually one in the prone position and one in Lauenstein's position (flexion and abduction)—the reduction is done on the x-ray table, and the control picture is taken immediately. The whole procedure, including the reduction and the taking of the control picture, should be completed within fifteen minutes after the injection. Even then the picture may start to become blurred, but more often than not one has ample time at one's disposal.

Irritation of the joint caused by perabrodil has not been clinically observed. A Swedish surgeon, Lagergren[4], who has used 35-per-cent. perabrodil for arthrography of knee joints when diagnosing torn menisci of the knee, has performed a biopsy of the synovial membrane in a subsequent arthrotomy in many cases. No signs of irritation that could reasonably be due to the contrast medium have been seen microscopically in the synovial membrane.

A more complicated method of needling—for example, by inserting the point at the apex of the greater trochanter and following the femoral neck while keeping in touch with the bone—together with a possible test injection of normal saline, is unnecessary, especially if the acetabulum is empty. Even in normal cases and in cases of subluxation, one soon learns to perform the needling from the front.

If the needling is done in the direction of the head, greater difficulties are bound to be met with when a free synovial membrane is entered than if an entry is made toward the empty acetabulum. Furthermore, in the latter case, the risk of puncturing the head itself is eliminated.

Up to the end of August 1938 we had made arthrographic examinations of about sixty hip joints and, as a rule, we had obtained good pictures. The ages of the patients varied from one to thirteen years. The

FIG. 1

Showing the size of the limbus in the newborn. (*Courtesy of A. Faber and Georg Thieme*[3].)

majority of the cases were "new cases of dislocation", but subluxations, relapsed dislocations, and normal hip joints were included in the study.

During the first years of childhood, a large and very important part of the acetabulum consists of the "limbus", otherwise known as labrum fibrocartilagineum, or labrum glenoidale, or acetabular lip. Thus, at birth, the cartilaginous acetabulum has, in great measure, the same comprehensiveness as the later, fully developed, bony acetabulum (Faber[3]). As the angle between a horizontal line through the Y-shaped cartilage and the roof of the acetabulum decreases, the limbus consequently becomes smaller. The size of the limbus in the newborn is seen in Figure 1; by painting the dissected edge of the limbus, an excellent picture has been obtained.

The synovial membrane arises not from the edge of the limbus but higher up, thus leaving a pointed pocket between itself and the outer side of the limbus. The pocket encircles the joint and, filled with contrast medium, freely projects its vertex on the arthrogram in the shape of a thorn (we call it the "limbus thorn"), and sharply outlines the edge of the limbus. The remaining part of the pocket appears as a ribbon corresponding to the border of the cartilaginous acetabulum. Laterally around the neck the contrast medium is collected as another circular ribbon. Between the two rings there is a circular region free of contrast medium or relatively deficient in contrast medium,—a condition caused by the zona orbicularis, which, in this situation, presses the synovial membrane against the underlying parts of the head, particularly as the head is displaced one millimeter or so laterally by the injected contrast medium. If the femoral head and the acetabulum fit exactly and are pressed against each other, the joint space is sharply defined as a rather thin line of contrast medium. (See Figures 2-A and 2-B.)

In order to study the details of the arthrogram more closely, the author has, in post-mortem material, injected a fluid opaque substance (celloidin mixed with cinnabar), which has later been allowed to solidify. Celloidin flows sluggishly and is best injected with the aid of a metal syringe, the threaded piston of which is powerfully screwed forward. An arthrogram is then taken.

The hip joint is next exposed, and the hardened and bright-red

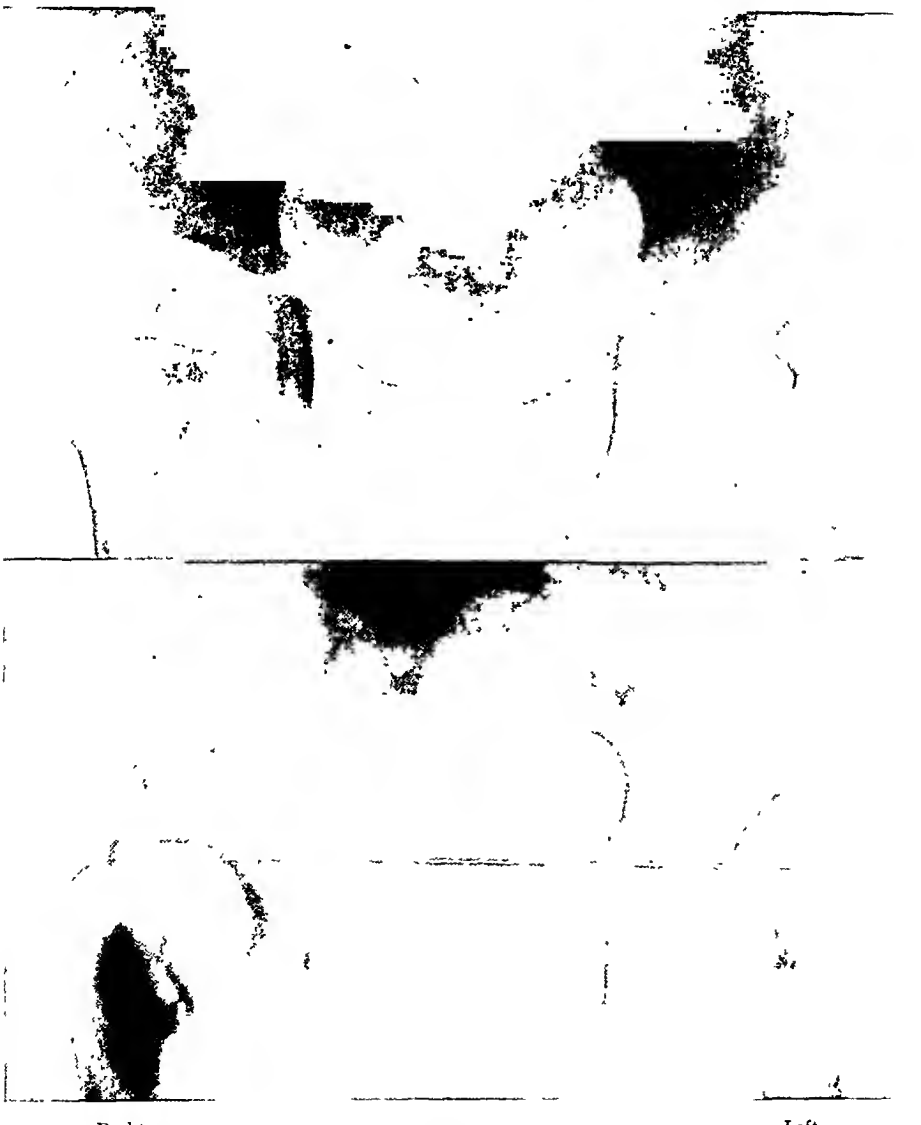


FIG. 2-A

FIG. 2-B

S. N., No. 2694, a boy, aged one year and seven months. The right hip is normal, but there is congenital dislocation of the left hip.
Fig. 2-A (*upper*): Ordinary roentgenogram.
Fig. 2-B (*lower*): Arthrogram.

FIG. 3

Arthrogram of a still-born child, taken with celloidin mixed with cinnabar. The hips are normal, but the femoral head is pressed a little out of the acetabulum by the injected material. Note the deep slit in the lower part of the arthrogram, caused by the ligamentum transversum. Note also the two prongs which indicate the attachment of the ligamentum teres.

celloidin is seen in the joint. Its exact distribution may then be easily examined. The insertions of the synovial membrane both on the limbus and on the femoral neck are easily identified. The deep, rounded, sharply defined slit in the lower medial part of the arthrogram is caused by the ligamentum transversum. (See Figure 3, the right hip.) As the

FIG. 4

L. B., No. 2879/37, a girl, two years of age. There is well-marked subluxation of both hips.

outer layer of this ligament is a direct continuation of the limbus, it demonstrates the medial and downward extent of the acetabulum just as the limbus thorn shows its upward limit. Medial to the ligamentum transversum there is a layer of contrast medium, which penetrates deeply around the attachment of the ligamentum teres. The point of this layer is divided by the attachment of the ligamentum teres into two prongs—an anterior medial and a posterior lateral—which have pushed aside the soft tissues of the acetabular notch, causing the synovial membrane to protrude into the two small recesses. Thus these prongs, sharply defined in the arthrogram, indicate the site of attachment of the ligamentum teres. Both the prongs are, as a rule, projected onto each other. (See Figure 3.)

In a normal hip joint, according to Faber, the arthrogram should show the following conditions:

1. The limbus thorn should lie under, or possibly from one to two millimeters above, the horizontal line through the Y-shaped cartilage.
2. The cartilaginous acetabulum should cover at least half of the femoral head.
3. There should be no great quantity of contrast medium in the bottom of the acetabulum, indicating that the head is not resting on the acetabulum.
4. The shape of the head of a normal hip joint should be practically spherical.

In a case of subluxation, one sees varying degrees of displacement of the head laterally and upward, which causes a "contrast-medium pool"

FIG. 5-A FIG. 5-B

B. A., No. 1537/37, a girl, two years of age, with dislocation of the left hip.
Fig. 5-A: Thigh in neutral position.
Fig. 5-B: Thigh in Lauenstein's position.

in the bottom of the acetabulum, and the limbus thorn is pushed upward, thus withdrawing more and more from the horizontal line through the Y-shaped cartilage. The cartilaginous acetabulum, in consequence, will cover less than half of the head. As long as it can be determined by the two indicators—the limbus thorn and the edge of the cartilaginous acetabulum—that the entire head is still covered by the cartilaginous acetabulum, it is a case of subluxation only, not of dislocation. The line of demarcation between these two conditions can, with the help of arthrography, be more sharply drawn than has hitherto been the case. (See Figure 4.)

In a case of complete dislocation the head has glided past the limbus, which, on account of its elasticity, slips back toward its original position,—that is, not above as normally, but medial to the head, where it causes an impression in the contrast medium of the arthrogram. The isthmus of the synovial membrane is clearly visible. In the contrast medium there is often found, from the head to the floor of the acetabulum, a faint streak caused by the ligamentum teres. (See Figure 5-A and 5-B.)

By paying attention to these details, one can get a good idea of the anatomical conditions within the joint, a knowledge of which is important for our therapeutic practice.

The following brief reports of findings, with the accompanying illustrations, in three cases of congenital dislocation of the hip, demonstrate the value of arthrography in the treatment of this deformity.

Case 1. B. L. (No. 1823/37) was born on January 21, 1936, with a dislocated left hip. An arthrographic examination was made on June 19, 1937. (See Figures 6-A and

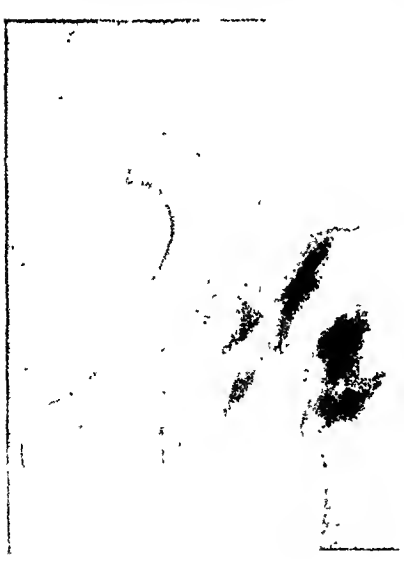


Fig. 6-A

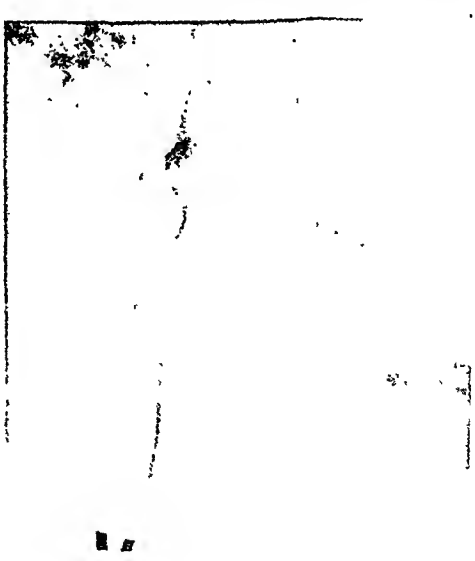


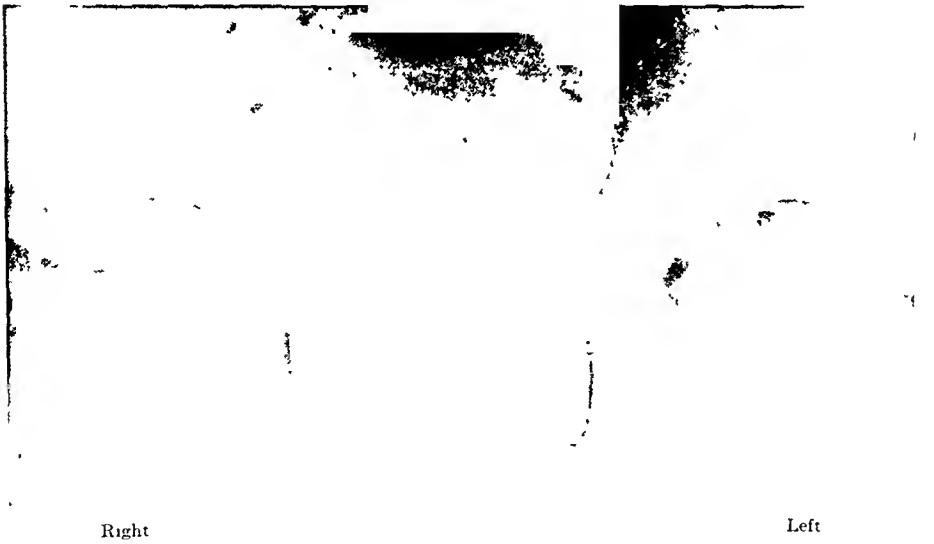
Fig. 6-B

B. L., No. 1823/37, a girl, one year and five months of age, with dislocation of the left hip.
Fig. 6-A: Before reduction.
Fig. 6-B: Immediately after reduction (abducted flexed position).

6-B.) The head is somewhat flattened from the medial side, and there is a rather broad isthmus. Through the contrast medium a powerful ligamentum teres is sharply outlined. The limbus is sandwiched between the femoral head and the ilium. After reduction, the limbus extends over the head, which, however, does not penetrate to the floor of the acetabulum. In all probability it is the powerful ligamentum teres which prevents a complete reduction. The small contrast-medium defects in the bottom of the acetabulum, where the contrast medium is remarkably thin after the reduction, are probably caused by the puckered ligament.

Right Left

FIG. 7-A



Right Left

FIG. 7-B

B. K., No. 1821/38, a girl, aged one year and ten months. The right hip is normal, but the left hip is dislocated.

Fig. 7-A: Before reduction.

Fig. 7-B: Immediately after reduction.

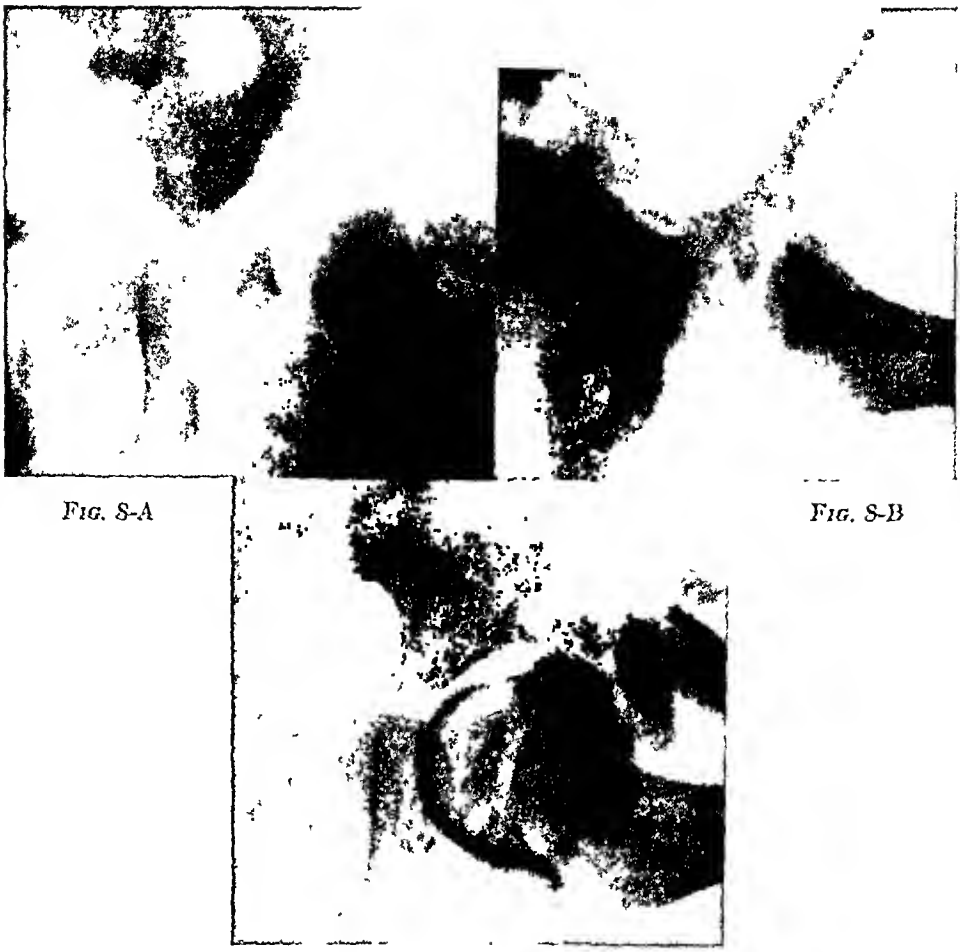


FIG. 8-A

FIG. 8-B

FIG. 8-C

S. N., No. 2946/37, a boy, aged one year and six months at the time of reduction. The left hip was dislocated.
Fig. 8-A: Before reduction.
Fig. 8-B: Immediately after reduction.
Fig. 8-C: Arthrogram seven months and ten days after reduction.

CASE 2. B. K. (No. 1821/38) was born on July 19, 1936. An arthrographic examination was made on June 8, 1938. (See Figures 7-A and 7-B.) On the left side the dislocated head is small and deformed. There is a narrow isthmus, within which the ligamentum teres is clearly seen. An unmistakable limbus impression is visible medial to the head. After reduction manipulation, both the limbus and the ligamentum teres seem to prevent a complete reduction. In the right hip, the clear outlines of the limbus thorn and the ligamentum transversum, with the contrast-medium prong on the medial side of them, are seen.

In spite of these observations, it is quite possible that, in time, a reduction with the leg in continued abduction will be satisfactory without operative procedures, for the ligamentum teres atrophies, and the head more often than not forces its way under the edge of the limbus. If the limbus also is subject to atrophy, this will, it is true, allow the head to glide in toward the floor of the acetabulum, but this development is in

any case less desirable. Without a limbus the acetabulum becomes still shallower.

It is particularly difficult to determine a possible medial displacement of the head during treatment by measuring the parts of the skeleton visible in an ordinary roentgenogram. Errors of projection are difficult to avoid, and one does not know the thickness of the cartilage either in the bottom of the acetabulum or on the head. The only means of determining with certainty and without operation whether or not the reduction under the circumstances in question has improved during the fixation is by making a further arthrographic examination.

CASE 3. S. N. (No. 2946/37) was born on February 12, 1936. An arthrographic examination was made on September 10, 1937. (See Figures 8-A and 8-B.) On the left side there is a narrow, extended isthmus of synovial membrane and the ligamentum teres has not caused any obvious defect in the contrast medium. The limbus is situated medial to the slightly deformed head. Judging by the somewhat blurred picture after reduction, the head has satisfactorily passed to the floor of the acetabulum. The limbus, however, is not outlined.

In a further arthrogram, taken on April 20, 1938, a good seven months later, the limbus is clearly outlined, powerful, and well developed. The head also seems to have acquired a more spherical shape. (See Figure 8-C.)

Such a development of the limbus should contribute toward favorable results of the treatment, but it does not alone play the decisive part. If no bony roof of the acetabulum has been developed, the head cannot resist the tendency toward redislocation. The development of the bony roof of the acetabulum is the final determinative factor, but if the cartilaginous limbus is preserved the chances of the development of a normal joint are greater.

Examinations by means of arthrography are still being carried out and, when they are completed, a further record of the results will be published. Certain changes have also been made in the usual methods of treatment of congenital dislocation of the hip. Facts concerning these modifications and the anticipated improved results thereby obtained will also be given.

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SKELETAL METASTASIS IN CANCER

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The present article deals with metastatic carcinoma and concerns itself primarily with skeletal metastasis. It is based on a collection of 5739 cases of carcinomata arising from various organs. The purpose of this communication is to emphasize the incidence of skeletal metastasis in which there is no clinical evidence of a primary lesion, and to submit other data relative to osseous invasion by metastatic carcinoma.

There were 356 cases in which carcinomata metastasized to bone. The primary source of the metastasis was definitely determined clinically in 296 instances. In sixty cases, or 16.8 per cent., however, there was no clinical evidence as to the source of the primary growth. The first indications of disease in this group of metastases of unknown origin were symptoms referable to the skeletal system. "Rheumatic pain" was a common complaint, and in several instances the patients were treated for arthritis. In one case a mass was palpated in the neck, and this later proved to be a lymph-node metastasis; in the remaining fifty-nine cases there were no subjective or objective findings referable to other systems. Pathological fractures occurred in nineteen instances, or 31.6 per cent., and solitary lesions in thirty-four, or 56.6 per cent. The bones involved, in order of frequency, were: femur, spine, humerus, pelvis, ribs, skull, and other bones to a lesser degree. (See Table I.)

The diagnosis in each instance was dependent on microscopic study of sections removed at biopsy. In sections with typical histological changes of hypernephroma, it was possible to determine the source of the metastatic lesion on the microscopic evidence. In the remaining cases a diagnosis of metastatic carcinoma could definitely be made from the sections, but no opinions were ventured as to the possible sources of the lesions.

The microscopic analysis of this group showed that hypernephroma was responsible for metastasis in twenty-two, or 36.6 per cent., of the cases in which no clinical evidence of the primary lesion was obtained. Sixty-five cases of hypernephroma were collected in this Laboratory; twenty-seven of these, or 41.5 per cent., had metastasized to bone. The kidney lesion was determined clinically in only five instances.

At autopsy, the lung proved to be the source of metastasis in one instance; in another, the suprarenal gland. Autopsy was not obtained in the remaining cases.

METASTATIC CARCINOMA OF BONE WITHOUT CLINICAL EVIDENCE OF PRIMARY LESION

Pathol. No.	Color	Sex	Age at Onset (*Years*)	Location of Metastasis	Pathological Fracture	Microscopic Findings	Source
56988	White	Male	Adult	Multiple lesions of rarefaction in all skeletal bones		Hypernephroma	Kidney
56608	White	Female	45	Ninth thoracic vertebra		Carcinoma	Undetermined
56320	White	Female	64	Femur and radius		Hypernephroma	Kidney
55216	White	Female	46	Upper third of humerus		Carcinoma	Undetermined
55128	White	Male	70	Eighth thoracic vertebra		Carcinoma	Undetermined
54670	White	Male	53	Middle third of humerus	Humerus	Carcinoma	Undetermined
54556	White	Male	Adult	Skull and hip		Carcinoma	Undetermined
54326	White	Male	45	Femur		Carcinoma	Undetermined
53548	White	Male	67	Multiple skeletal lesions		Carcinoma	Undetermined
53478	White	Female	40	Neck of emur		Carcinoma	Lung
53166	White	Male	36	Femur and tenth rib. Preceded by lump in neck.	Femur	Carcinoma	Undetermined
53012	White	Male	68	Condyle of femur		Hypernephroma	Kidney
53010	White	Male	48	Multiple skeletal lesions		Hypernephroma	Kidney
52732	White	Female	65	Sacrum and ilium		Carcinoma	Adrenal gland (?)
51064	White	Male	64	Multiple skeletal lesions	Second rib	Carcinoma	Undetermined
50046	White	Female	54	Iliac bone and lung		Carcinoma	Undetermined
49162	White	Female	48	Ribs and thoracic vertebra		Carcinoma	Undetermined
48878	White	Female	59	Eighth and ninth vertebrae		Carcinoma	Undetermined
48207	Colored	Male	27	Radius		Carcinoma (?)	Undetermined

TABLE I (*Continued*)

Pathol. No.	Color	Sex	Age at Onset (*Years*)	Location of Metastasis	Pathological Fracture	Microscopic Findings	Source
44000	White	Male	64	Femur	Femur	Carcinoma	Lump removed from breast four years previously (no pathological diagnosis)
43920	White	Female	58	Multiple skeletal lesions		Carcinoma	Undetermined
43792	White	Female	33	Tibia	Tibia	Carcinoma	Undetermined
43790	White	Male	32	Humerus	Humerus	Carcinoma	Undetermined
43764	White	Male	59	Lower quarter of femur		Carcinoma	Undetermined
43680	White	Female	52	Ilium and right hip		Carcinoma	Undetermined
43474	White	Male	65	Twelfth thoracic vertebra		Hypernephroma	Kidney
43430	White	Male	25	Coccyx		Hypernephroma	Kidney
43266	White	Male	45	Upper third of left femur, left ilium	Left femur	Carcinoma	Undetermined
52706	White	Male	56	Left femur	Femur	Hypernephroma	Kidney
37088	White	Male	62	Upper third of right humerus		Hypernephroma	Kidney
36524	White	Male	66	Second, third, and fourth right ribs, sixth thoracic and third lumbar vertebrae	Rib	Hypernephroma	Kidney
36178	Colored	Female	58	Middle third of right femur	Femur	Carcinoma	Undetermined
36118	White	Male	49	Shaft of femur	Femur	Carcinoma	Undetermined
35910	White	Male	35	Humerus, clavicle		Carcinoma	Undetermined
35762	White	Male	82	Lower end of right femur	Femur	Hypernephroma	Kidney
35512	White	Male	48	Tarsal and metatarsal bones of left foot		Hypernephroma	Kidney
35416	White	Male		Upper end of right femur	Femur	Hypernephroma	Kidney
34362	White	Male	56	Humerus		Hypernephroma	Kidney
				[illegible] right humerus		Carcinoma	Undetermined

32974	White	Male	40	Sixth rib		Hypernephroma	Kidney
32792	White	Female	45	Frontal bone, scapulae, ischium, fibulae		Carcinoma	Undetermined
32446	White	Female		Ilium		Carcinoma	Undetermined
31887	White	Female	52	Upper end of left femur, left ischium	Femur	Hypernephroma	Kidney
30983	White	Male		Fourth lumbar vertebra, right sacro-iliac joint, right ilium, skull (parietal region)		Hypernephroma	Kidney
30867	White	Female	32	Sixth thoracic vertebra		Carcinoma	Undetermined
30654	White	Male	70	Right clavicle	Clavicle	Carcinoma	Undetermined
30631	White	Female	69	Skull (right temporal bone, left parietal bone)		Hypernephroma	Kidney
29831	White	Female	56	Fourth, fifth, and sixth cervical vertebrae, skull		Carcinoma	Undetermined
29485	Colored	Female	37	Upper end of femur	Femur	Hypernephroma	Kidney
29461	White	Female	55	Mid-shaft of right humerus	Humerus	Hypernephroma	Kidney
29397	White	Male	28	All lumbar and thoracic vertebrae, second cervical vertebra, third rib, shaft of both humeri, upper end of femora	Upper end of femur	Hypernephroma	Kidney
27929	White	Male	29	Upper third of right tibia, sixth and seventh thoracic vertebrae		Carcinoma	Undetermined
27576	White	Male	46	Rib		Carcinoma	Undetermined
26264	White	Female	54	Right ilium, right clavicle, cervical vertebra, left parietal bone		Carcinoma	Undetermined
16245	White	Female	49	Right clavicle, left rib, right tibia, phalanx, right great toe, ilium, sacrum, femur, right rib		Carcinoma	Undetermined
6930	White	Male		Humerus		Hypernephroma	Kidney
6380	White	Male	50	Humerus, metatarsal bone	Humerus	Carcinoma	Undetermined
6299	White	Male	52	Femur	Femur	Hypernephroma	Kidney
1382	White	Male	43	Scapula		Carcinoma	Undetermined

The diagnosis of metastatic carcinoma in this group of undetermined origin offered a difficult clinical problem. The age at onset in all cases of skeletal metastasis varied from twenty-one to eighty-two years, averaging forty-nine years. Although the mean age, in lesions of carcinoma, is considerably higher than that found in the various primary tumors of bone, age cannot be considered a very significant factor in diagnosis because of the extreme variation in both primary and metastatic groups. In our series of osteolytic osteogenic sarcomata of bone, one case was encountered in a colored male, seventy-eight years of age, while in the present group of carcinomata, there was a case in a white male, twenty-one years of age. The age incidence, when compared to that of multiple myeloma, is relatively lower, since in the latter condition it averages about fifty-five years. The presence of Bence-Jones bodies in the urine may be helpful. These bodies are found in 65 per cent. of the cases of multiple myeloma and are also encountered in other disturbances of bone. The experience of this Laboratory has been that Bence-Jones bodies occur in 3 per cent. of the cases with skeletal metastasis from cancer.

The roentgenographic changes in metastatic carcinoma vary. The lesion is often solitary and may simulate many types of bone affections. It may present a localized area of osteoporosis and resemble the osteolytic variety of osteogenic sarcoma, or a patchy sclerosis and resemble the sclerotic type. Similarly, multiple lesions of carcinoma may simulate those of Hodgkin's disease, the leukaemias, and multiple myeloma, making it impossible to differentiate the various affections roentgenographically. Ewing's sarcoma, chronic osteomyelitis, syphilis, tuberculosis, osteitis fibrosa cystica, and other tumors of bone may closely resemble lesions of carcinoma. The difficulties in diagnosis are best exemplified in the case of a white male, fifty-six years of age, who slipped while pushing a cart. He experienced violent pain in the left thigh and was unable to continue working. A roentgenogram, taken three months later, proved negative for bone involvement. In the following month, or four months after the original injury, while turning in bed, the patient felt "something snap" and experienced severe pain in the left thigh. Another roentgenogram, taken at this time, showed a pathological fracture. Seven months later metastasis to the lungs developed. There was no evidence of a primary lesion during the life of the patient. At autopsy, a hypernephroma was found situated in the substance of the kidney.

In a survey of 2306 cases of breast cancer, collected in the Surgical Pathological Laboratory, 120 cases, or 5.6 per cent., gave clinical evidence of bone metastasis. The statistics on skeletal metastasis in breast carcinoma are very variable. Gross[7], in a series of 134 cases of breast tumor, showed skeletal metastasis, by pathological section, in from 15.7 to 20.5 per cent. Carnett and Howell[5], in a roentgenographic study of 204 cases, showed bone involvement in 101 or 49.5 per cent. The majority of our series occurred between the ages of thirty-five and fifty-five, the extremes being twenty-one and seventy-three. The interval between the

TABLE II

Sites and Incidence of Skeletal Metastasis *

Site of Primary Lesion	Total No. of Cases	No. of Cases of Metastasis to Bone‡	Pelvis	Spine	Femur	Humerus	Skull	Clavicle	Ribs	Tibia	Sternum	Bones of Foot	Scapula	Radius	Ulna	Fibula	Patella	Bones of Hand	Pathological Fractures
Breast	2306	120	36	36	26	8	17	3	15	1	4	2	3.	2	1	1	0	2	14
Prostate **[6]	1041	136	100	69	7	1	1	1	2	1	0	0	1	0	0	0	0	0	3
Stomach	750	7	2	2	3	0	1	0	4	0	1	0	1	0	0	0	0	0	1
Thyroid	76	6	0	0	1	2	1	1	1	0	1	0	0	0	0	0	0	0	2
Uterus	86	5	4	0	2	1	1	0	0	0	0	1	0	0	0	0	0	0	0
Lung	60	7	1	2	2	1	2	0	2	0	0	0	0	0	0	0	0	0	1
Skin (Squamous)	425	2	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Testicle	45	1 †	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Nasopharynx	139	1	0	1	0	0	1	1	1	0	0	0	1	0	0	0	0	0	0
Bladder	0	2	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Oesophagus	80	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liver	46	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kidney (Hypernephroma)	65	27	3	6	7	8	2	0	4	1	1	2	0	0	0	0	0	0	10
Colon	250	2	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rectum	370	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1

* The cases in which the primary lesion has not been determined and listed in Table I are not included in this series.
** From the Brady Urological Institute and Surgical Pathological Laboratory.
† Carcinoma of questionable diagnosis.
‡ Tumors of the adrenal gland are not included in this series.

appearance of the primary tumor and metastasis varied from zero to twenty years, averaging thirty-nine and two-tenths months; and the period from the time of primary operation and metastasis ranged from five weeks to eighteen and twenty-five-hundredths years, the average being thirty-one and three-tenths months. The bones most frequently involved were those of the spine, the pelvis, and the femur, the remaining being distributed as shown in Table II. Solitary lesions occurred in 31 per cent. of the cases. The size or extent of the primary malignancy was no index of the probability of metastasis. Breast tumors were occasionally palpated for the first time by the surgeon after there had been roentgenographic manifestations of metastasis. The duration of life in cases which exhibited skeletal metastasis at some period varied with the type of treatment given the primary lesion. In the cases of inoperable breast carcinoma with skeletal metastasis, the average duration of life was ten months, as compared to eighteen months in cases of breast cancer with radical operation. Irradiation of the metastatic lesions was performed in a number of cases, and, when not employed, the duration of life was diminished by one-third.

In a series of 1041 cases of prostatic cancer there were 136 instances of skeletal metastasis, an incidence of 13 per cent. Bumpus [4] found skeletal metastasis in from 30.3 to 51 per cent. of the cases of prostatic cancer, while Kaufmann [9] observed it in from 34 to 70 per cent. The figures submitted from this Laboratory are based on clinical observations, and, since roentgenograms were taken in only 50 per cent. of the cases, the percentage is probably much higher than indicated. The age incidence averaged sixty-four years. The average duration of the primary tumor before metastasis was twenty-two and eight-tenths months as compared to nineteen and five-tenths months for the interval between primary treatment and metastasis. The pelvis and spine were the seat of metastasis in 92 per cent. of the cases, and these bones frequently presented sclerotic changes. Pathological fractures occurred in only three instances, or 2 per cent.

Zeman [17] showed that skeletal metastasis in carcinoma of the bladder varied from 11.86 to 47 per cent. of the cases. The series from this Laboratory is small, and there were two instances of bone involvement.

The incidence of skeletal metastasis in cancer of the oesophagus and gastro-intestinal tract was also found to vary with the clinic submitting such data. Kaufmann [10] reported skeletal metastasis from carcinoma of the oesophagus in 6.9 per cent. of the instances, while von Mielecki [12] reported metastasis in 1.7 per cent. Kerr and Berger [11], in reviewing the literature, found bone involvement in from 1 to 22 per cent. of the cases of stomach cancer. In a collection of 156 cases of carcinoma arising in the stomach, von Mielecki [12] listed eight as metastasizing to bone. Bacon and Gilbert [2] reported skeletal metastasis to the coccyx from cancer of the anus, rectum, and colon in 5.9 per cent. of the cases; other bones were involved in 0.9 per cent., or less. In a series of eighty cases of oesophageal

cancer, collected in the Surgical Pathological Laboratory, there was one instance of skeletal metastasis. There were seven cases of bone involvement, an incidence of less than 1 per cent., in a total of 750 cases of stomach cancer. Skeletal metastasis from cancer of the large intestines and rectum occurred in three of 620 cases.

The liver was responsible for metastasis to bone in one of forty-six cases of primary cancer. Boyce and McFetridge [3] reported that the combined figures of the American and European clinics showed that primary carcinoma of the liver was found in 0.219 per cent. of all autopsies as compared to 1.05 per cent. in the combined African and Asiatic clinics. According to Moon [13], skeletal metastasis from this organ is very rare.

The statistics on thyroid cancer vary with the locality. Wilson [16] stated that cancer of the thyroid is found in one out of 2546 autopsies in the Mississippi Valley region and in one out of 211 autopsies in San Francisco. Pemberton [14] showed that skeletal metastasis occurred in 6 per cent. of the cases of thyroid carcinoma. There were seventy-six cases of thyroid cancer collected in this Laboratory, six having metastasized to bone. There were three females and three males, and all were of the white race. The ribs, sternum, clavicle, humerus, skull, and femur were the bones involved, and pathological fractures occurred in two cases. The average duration of life following metastasis was twenty-one months.

Cancer of the lung is relatively uncommon. The incidence based on a review of the literature is less than 1 per cent. of all cancer, with skeletal metastasis in 29.1 per cent. (Grove and Kramer [8]). Skeletal metastasis occurred in 12.5 per cent. of the cases reported by Adler [1]. Our series includes sixty cases, with bone involvement in seven. There were four males and three females, one of whom was of the colored race. The ages varied from thirty-nine to fifty-five years. The femur, spine, ribs, and skull were involved twice; the humerus and pelvis, once. A pathological fracture occurred in one instance.

The incidence of skeletal metastasis in uterine cancer is low. Philipp [15] reported from 1 to 5 per cent., and Kaufmann [10], 5.03 per cent. The present group includes eighty-six cases of cancer involving the female genital tract; skeletal metastasis occurred in five. Of these five patients, four were white and one was colored. The age varied from thirty-five to sixty years, averaging forty-seven. The pelvis was involved in four instances; the femur, in two; the humerus, a metatarsal bone, and the skull, once each.

The remaining three cases of skeletal metastasis resulted from primary lesions of the skin and the nasopharynx. There were 425 cases of squamous cancer, and metastasis occurred in two. Cancer of the nasopharynx occurred in 139 cases, with skeletal metastasis in one case.

SUMMARY

1. Skeletal metastasis resulting from a carcinoma may occur without any clinical evidence of a primary lesion.

2. The prostate is the most common source of skeletal metastasis; the breast, second; the kidney, third, while the stomach, lung, thyroid and other organs are involved less frequently and in the order given.

3. The size of the primary lesion is no index of the probability of metastasis.

4. Metastasis to bone may occur many years following the primary operation, and in the present series of cases of breast cancer skeletal metastasis was observed as late as eighteen and twenty-five hundredths years postoperatively.

5. Irradiation of the osseous lesions relieves pain and prolongs the life of the patient.

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A NEW OPERATIVE TREATMENT OF TUBERCULOUS COXITIS IN CHILDREN

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This paper is a report of an operation performed in seventeen cases of tuberculosis of the hip. In seven cases the procedure was carried out during the acute stage; in the others, during the chronic period. Although some of these cases have been watched for a five-year period, the observations are to be continued and the findings will be reported later.

The author was led to devise this operation because of the discouraging results both of the conservative treatment and of the fusion operation. Even the strong advocates of the fusion operation, such as Farrell, Hallock, and Toumey, admit a high percentage of failure of fusion in children suffering from tuberculous coxitis. Farrell sees the problem of coxitis in its true aspect, declaring that "this condition is the most distressing, difficult, and unsatisfactory problem we have to deal with". As to the intervention, he states: "It is essential that the operation shall be applicable to children, where the ossification of the femoral head and acetabulum is incomplete." Among the causes of failure, he lists "the difficulty in maintaining immobility, and in children incomplete ossification".

The failure of the conservative treatment is, in the writer's opinion, due to the fact that, despite the best application of plaster-of-Paris or of traction, real rest of the joint is not secured. There is a constant reflex contraction of the muscles, which possibly may be due to the irritative effect of toxins starting from the inflamed joint surface and streaming back through the reflex arc into the muscles around the hip. Reflex compression and shearing forces are then initiated, which prevent complete rest. This pressure and the shearing forces are further augmented by the ever-increasing atrophy of the leg in the plaster, whereby the cast becomes relatively wider. Another cause of the pressure might be the growth of the leg. Both malposition and destruction show that the adductors and the iliopsoas may play the chief rôle in the production of the changes mentioned.

In order to abolish the effect of these muscles on the joint—that is, to eliminate pressure and shearing—and to establish this condition of rest, the author performs a subtrochanteric osteotomy with consequent distraction and displacement of the fragments. Thereby the adductors are enabled to pull the lower fragment in the direction of the ischium instead of its being directed toward the joint, and the iliopsoas may exert a flexion movement by means of the short mobile upper fragment to the extent that motion is allowed by the joint.

To prevent the fragments from losing contact after the displaeement,

a silk suture is applied between them. The silk suture also promotes ossification and recalcification. (See Figure 1.) This was first observed in an operative method to assure the desired position of the fragments in the bifurcation operation, which was described by the author about ten years ago. In order to confirm this observation, this operation was performed without the silk suture in three cases, and marked differences, both in the power of recalcification and in its rapidity, were seen as compared with the cases in which the silk suture was employed. Two of the writer's associates, Dr. Rojkó and Dr. Adorján, have shown in rabbits that this method of osteotomy followed by a silk suture has produced more atrophy at the beginning and much more bone apposition afterward than a simple osteotomy or the osteotomy described, without the silk suture. The same observation has been made in arthrodesis of the shoulder, where a silk suture is regularly employed between the head and the acromion in order to promote calcification.

OPERATIVE TECHNIQUE

The operation is a routine transverse subtrochanteric osteotomy. According to the usual technique, after the periosteum has been exposed, it is cut longitudinally and pushed to each side by means of a raspatory. Two large elevators are then introduced beneath the periosteal sheath. Next, two holes are drilled through the bone from without inward, the upper hole being just below the lesser trochanter and the lower at a distance of about an inch from the first. A No. 3 silk suture, conserved in alcohol and boiled for twenty minutes before the operation, is introduced into each hole from without inward, and the transverse osteotomy is performed. The fragments are fully separated and displaced in such a manner that the periosteal sheath is torn through, and the medial edge of the upper fragment comes into contact with the lateral edge of the lower one. At this point one can observe the pull of the muscles exerting their power at this level, as Steindler has described it.

FIG. 1

The effect of the silk on the calcium metabolism. Irreducible congenital luxation of the hip six weeks after the osteotomy. The silk is clearly seen between the fragments.

The medial end of the upper silk suture is loosely knotted with the lateral end of the lower one, and the lateral end of the upper silk suture with the medial end of the lower one. (See Figure 2.) The fascia and

skin are then closed in the routine manner. The thigh is abducted about 20 degrees, and a double plaster, including the other thigh, is applied. The plaster is removed from the sound thigh in three weeks. The other part of the plaster remains for two months.

DISCUSSION OF CASES

This procedure has been employed in seventeen cases. The first operation was performed on March 17, 1934, with the assistance of Dr. Makai, who kindly placed a suitable case at the author's disposal. Of the seventeen patients, sixteen were children ranging in age from four to fourteen years. The only adult was thirty years old. In seven cases, the disease was in the acute stage. In these cases, after the distraction and displacement of the fragments, there was regularly noted abundant yellowish thin liquid emerging from within the marrow cavity. Osteotomy performed in the manner described seems to provide for the drainage of the marrow cavity; a simple osteotomy cannot do so.

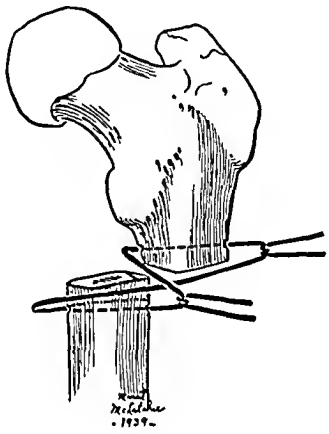

FIG. 2

We have operated in every stage, in every localization of the focus, and regardless of age. Sometimes (for example, in Case 3) the oedema of the tissues was so diffuse that neither the soft parts nor the bone itself bled. In no case has there been any difficulty in regard to the healing of the wound. In Case 3, nine months after the operation, in spite of the fact that the child had been walking without pain, an abscess developed above the site of the incision, followed by a fistula. This yielded in a few weeks to vaccine treatment. With the exception of this case, the author has observed no fistulae, sinuses, or protraction of the consolidation. (In one case, not included in this report, the writer stopped the operation before completion, because, after incising the fascia, he encountered a large abscess and, having had no experience in such cases, he did not feel it advisable to perform the osteotomy. Although the wound in this case healed *per primam*, in about two months severe fistulization began above the site of the incision.) In each case roentgenographic examination two months after the operation has shown the increasing disappearance of calcium in the parts above the osteotomy. At this time, the plaster has been removed and renewed for another two months. After four months, the calcification has always been found to have begun, and a walking plaster with a steel has generally been employed. This has been removed every two months. In from six to ten months after the operation, the patient has been given an appliance after the pattern of Thomas or Hessing. In an additional six months this also has generally been removed, and the patient has begun to walk without any support.

The author has never seen a recurrence, and, after removal of the appliance, there has been no further pain. In each case the operation has resulted in the reappearance in the roentgenogram of bone trabeculae across the hip joint. In two cases there was slight, painless movement in the hip.

Makai has also employed the author's method in several cases and has reported very good results.

The following six cases show the regular process of healing and the peculiarities which in general could be observed.

CASE REPORTS

Case 1. L. E., female, seven years old, had had a very painful right hip without any movement of two years' duration. She had been treated by plasters. Roentgenographic examination showed a coxitis of the more cystic type involving the neck and the ilium (Fig. 3). There were slight signs of recalcification.

Fig. 3

Case 1. Tuberculosis of the right hip of more cystic character.

On March 17, 1934, under lumbar anaesthesia, the operation described was performed. The bone was found to be very soft; the marrow cavity did not show any peculiarities. On July 27, 1934, the patient was discharged with a walking plaster.

Both the roentgenogram taken through the plaster and that taken two months after the operation (Fig. 4) showed an almost complete disappearance of the supratrochanteric portions of the femur. Two months later, the beginning of recalcification was noted (Fig. 5). In six months, dense newly formed trabeculae penetrated across the joint. In a year, the newly formed trabeculae became much richer in calcium. In two years, the femur and the acetabulum formed one powerful bone block. Figure 6 shows the hip four years after operation.

Case 3. M. L., male, six years old, had had tuberculosis of the left hip of three years' duration. He had been treated with plaster, but, in spite of his having been recumbent during this time, he had suffered severe pain and sensitiveness. Figure 7 does not show the borders of the joint surfaces, since everything was covered by the typical cloudy veil which is significant of the most acute stage of the disease (stage I of Mènard).

An operation was performed on March 6, 1935. There was no bleeding, but the marrow cavity contained a large mass of toxic material, which could be expressed under great pressure. The bone was very soft. The patient was discharged in four months. At that time there was no pain, and no movement in the joint was possible. On September 5, 1935, a walking plaster with a steel was applied.

On December 5, 1935, examination disclosed an abscess above the incision line. This was punctured, and later a slight fistula developed. Healing of the abscess and the

FIG 4

Case 1. Two months after operation. The supratrochanteric region seems to have completely disappeared, due to resorption of the calcium.

FIG. 5

Case 1. Four months after operation The region of the hip has reappeared; dense newly formed trabeculae penetrate into the joint.

FIG. 6

Case 1. Four years after operation.

fistula occurred in January 1936. Figure 8, taken nine months after the operation, shows the beginning of the reconstruction of the joint.

As the family went to the country, no further examination was possible, but the mother wrote that the child walked without any trouble.

In May 1937 the child died of tuberculous meningitis. Autopsy showed a stiff joint penetrated with newly formed trabeculae. The pathological specimen (Figs. 9 and 10)

FIG. 7

Case 3. Tuberculosis of the left hip. Before operation.

FIG. 8

Case 3. Nine months after operation. Advanced healing process. The joint borders are clearly seen.

FIG. 9

Case 3. Pathological specimen two years after operation. The dense newly formed bone trabeculae start from the site of suture and penetrate into the joint.

FIG. 10

Case 3. Roentgenogram of the specimen. Note the conspicuous route of the dense trabeculae starting from the site of suture.

revealed fully the results of the operation. The histological findings proved that the newly formed dense trabeculae started from the site of the suture. They penetrated through both the cancellous bone and the destroyed joint and found connection with the bony parts of the cavity. The bone was dense, and the new vessels around the remnants of the silk suture were numerous.

CASE 4. B. L., male, thirty years old, had had tuberculosis of the left hip of two years' duration. Slight painful movement was present in the joints.

An operation was performed on November 11, 1936. The patient was discharged without pain in two months. In a year, signs of Bechterew's disease developed. There was no trouble in the hip which had been operated on, but walking was difficult, owing to the affection of the spine.

CASE 5. F. J., female, seven years old, had had tuberculosis of the right hip of two years' duration. She had been treated by the author with plaster, with slight improvement. In 1935 pertussis had developed, followed by severe pain. No movement was possible, and merely touching the patient caused pain. The roentgenogram (Fig. 11) showed a most virulent stage of the disease. A cloudy veil covered the joint, and foci were evident on the neck and the trochanter.

An operation was performed on September 4, 1936. Diffuse oedema was present around the femur, but there was hardly any bleeding. From the marrow cavity there emerged tuberculous pus, full of Koch's bacilli. Healing progressed normally. In six

months, a walking plaster with a steel was applied. On December 23, 1937, at follow-up examination, the patient walked without any appliance. Figure 12 shows the reconstructed joint. Slight painless movement was present in the joint.

Case 6. F. T., female, nine years old, had had tuberculosis of the right hip of a few

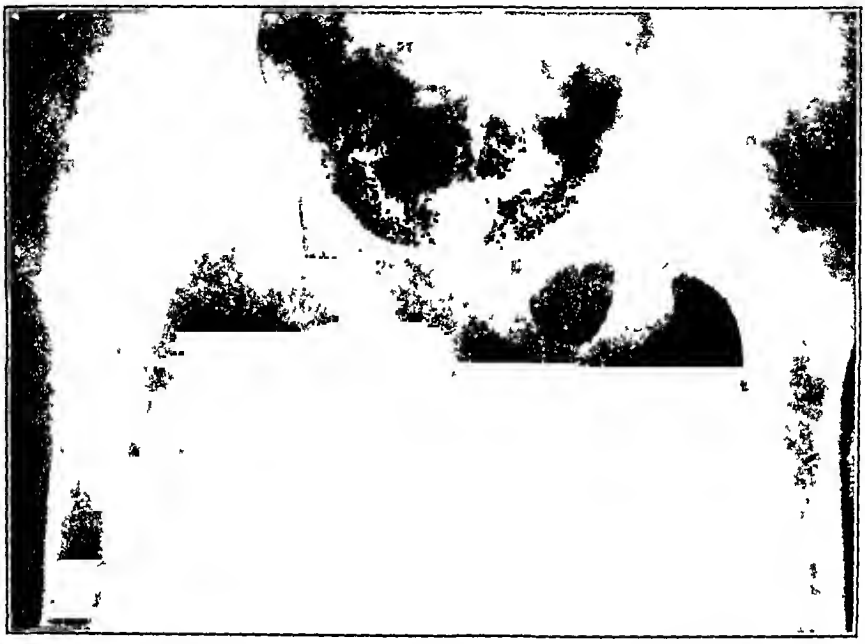

Fig. 11

Case 5. Tuberculosis of the right hip. Cloudy veil over the joint. The joint borders can hardly be seen.

Fig. 12

Case 5. One year after operation. Joint reconstructed. Dense bone trabeculae. The broken top of the drill is visible in the lower fragment.

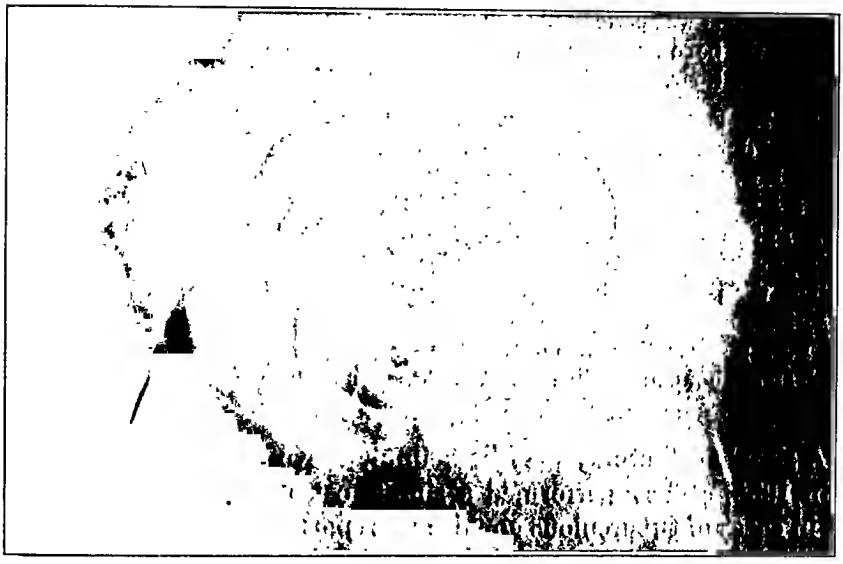

FIG. 13

Case 7. Bilateral tuberculous coxitis.

FIG. 14

Case 7. One and one-half years after first operation, showing complete reconstruction of the joint. Dense newly formed bone trabeculae were evident.

months' duration. She had been treated with plasters by the author. At the removal of the plaster on November 29, 1935, the hip showed a high degree of malposition. The joint was very painful. The roentgenogram confirmed the writer's supposition that the head of the femur was subluxated. The application of extension for a few days brought the head into the cavity again. A new plaster was applied. At the end of five months there was little improvement. The joint was painful, and no movement was possible. Roentgenographic examination showed diffuse decalcification of the joint.

An operation was performed on June 5, 1936. There was no abscess in the marrow cavity, but the bone was very soft. Examination on November 11, 1936, showed very satisfying conditions. The joint was painless and stiff, and a splint was applied.

CASE 7. F. G., male, thirteen years old, had had bilateral tuberculous coxitis of three years' duration. Slight adduction-abduction movements were possible, but very painful. Roentgenographic examination (Fig. 13) showed almost no distinct borders of the joint.

The right hip was operated upon on June 7, 1936; the left hip, on September 30, 1936. Healing progressed normally. At the follow-up examination, one year after the second operation, the patient walked without any difficulty and without any support. The joint surfaces seemed to be newly formed. (See Figure 14.) Flexion-extension movements were possible through an arc of 10 degrees; adduction-abduction movements, through an arc of about 15 degrees. All of these movements were painless.

COMMENT

A simple osteotomy may be helpful, as Kofmann and Tarlo pointed out in 1935. They performed a simple osteotomy on both femur and tibia in cases of tuberculous gonitis and reported very good results. Unfortunately, they did not publish reproductions of the roentgenograms, so that the author has not been able to compare their results with his.

The real purpose of the author was to find an indirect way to produce fusion in the diseased joint without coming into contact with the focus of the disease and without opening the capsule. As the capsule very often reaches the lesser trochanter, the author has not employed an intertrochanteric osteotomy, although it might have assured a more perfect condition of rest by the elimination of the effect of the iliopsoas on the joint.

The effect of the subtrochanteric osteotomy on bone formation in the region above the lesser trochanter can be demonstrated in certain cases of pseudarthrosis of the neck of the femur, when, after the application of a similar method, the site of the fracture proves to be completely ossified.

After the osteotomy excessive atrophy develops, followed by rapid and copious recalcification. The author's method completes the process of healing in a much shorter time than other methods.

Weight-bearing plays an important rôle in the process of the deposition of calcium. It is a matter of fact that the early use of the leg is of great value in effecting a quick recovery, but it presupposes a painless joint. In the author's series, walking plasters were applied four months after the operation, which may account for the rapid calcification.

The results proved that in the duration of the disease and in its complications the mechanical influence was of prime importance.

Another point of definite advantage is the possibility of the correction of the malposition by this operation. If an extra-articular arthrodesis is performed, an additional operation is required to accomplish this.

SUMMARY

1. No condition of perfect rest is possible with conservative treatment of coxitis. The adductors and the iliopsoas exert a particularly harmful effect on the joint.

GOLD THERAPY IN PROLIFERATIVE (ESPECIALLY ATROPHIC) ARTHRITIS *

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In this paper we will not review the literature, but will merely state that in England and on the Continent gold salts are now well known and favorably regarded as drugs for the treatment of proliferative arthritis, but with little or no value for the management of degenerative arthritis. In the United States there have been only a few contributions to the subject. One was by Phillips, who stated that the hazard was such that he personally did not feel competent to handle the drug to the advantage of the patient. Sashin amd Spanbock concluded: "Intravenous gold therapy when given in small doses in selected cases of rheumatoid arthritis is a safe procedure and offers us the best means of combating the disease." Holbrook and Hill stated that the results were disappointing.

We were persuaded to use the drug by Dr. Jacques Forestier when he visited this country a few years ago, and we have been enabled to continue the clinical experiment with the help of Merck and Company, who have generously given sufficient amounts of the relatively costly drug.

Fortunately for our patients, we were early impressed with the fact that treatment with gold is not a safe procedure. However, we believed that if it really benefited patients with atrophic arthritis to the degree which was claimed in the literature the reactions to be expected should not deter us from using it, although we realized that we were using the drug empirically and did not know the manner in which it acted.

We have treated with myochrysine seventy patients with arthritis of the proliferative type. These cases are classified as follows: true atrophic arthritis, fifty-three; proliferative arthritis following rheumatic fever, two; chronic proliferative arthritis apparently due to gonorrhoea, four; proliferative arthritis associated with lymphogranuloma, two; and spondylitis ankylopoietica, nine.

This was not a selected group, except that in each case before the treatment was started we were agreed that the patient had an active arthritis of the proliferative type, which appeared to be chronic and progressive and of sufficient gravity to warrant the repeated administration of an admittedly dangerous drug. In only three patients had the disease been present less than one year; in nineteen the duration was from one to two years; in thirty-seven it was from two to ten years; and in eleven the disease had been present over ten years.

* Read before the American Rheumatism Society, San Francisco, California, June 12, 1938.

Due to the fact that we were not able to run a control series of patients in this study, we have inquired into the previous treatment which our fifty-three patients with atrophic arthritis had received. We find that each of them had first consulted his family physician and had been given salicylates or other medicines over a variable period of time. Six of them had been on low-carbohydrate diets; twenty-eight had been treated by physical therapeutic methods, of which heat in the form of infra-red and diathermy were the most popular; thirteen had been treated by irregular practitioners; five had been hospitalized for considerable periods for their disease; seven had been treated at large diagnostic clinics; twenty-three had had spa treatment; and thirty-three had had vaccine treatment of various types. In this group of fifty-three patients there had been sixty-six operations performed for the removal of foci of infection. In twenty-four of them tonsillectomies had been performed; in nineteen all of the teeth had been extracted; and in ten some of the teeth had been removed. There were also six appendectomies, three hysterectomies, two nose operations, and two cholecystectomies, all for removal of foci of infection in an effort to alleviate the arthritis.

In spite of these various types of treatment, the disease had remained active and we believe that it is thus evident that in such a group of patients controls are not necessary in order to estimate the effect of gold therapy.

Before a patient was started on gold therapy a general physical examination and routine blood and urine examinations were made and the sedimentation rate of the blood was determined by the Westergren method.

METHOD OF TREATMENT

The only gold preparation used was myochrysine (sodium aurothiomalate), and this was administered by intramuscular injection with a fine needle in the deltoid or gluteal region. It is relatively painless and does not cause a local reaction. It contains 50 per cent. gold and is supplied in 1-cubic-centimeter ampoules containing 0.05 or 0.1 gram of myochrysine. In adults our usual initial dose was 0.05 gram; one week later 0.1 gram was given, and this dose was continued for twenty weeks until the patient had received 2 grams of myochrysine or 1 gram of gold. If a toxic reaction occurred, we discontinued the treatment or decreased the dose. In children the initial dose was 0.0125 gram, and this was increased to 0.025 gram.

At the end of the first course of treatment the patient was given a rest period of six weeks; then, if the disease was still active or if the blood sedimentation rate was accelerated, a second course was given; after a second rest period of from four to six months, a third course was given if indicated. In our series twenty patients received only 1 gram or less of myochrysine; twelve patients, from 1 to 2 grams; twenty-six patients, from 2 to 4 grams; and twelve patients, from 4 to 6 grams.

In addition to the gold therapy, attention was given to the diet of the patients while under treatment, and, unless otherwise indicated, a normal balanced diet of ample vitamin content and of a calorie value suited to the needs of the individual was prescribed. To this we routinely added vitamin C in rather large doses (three 0.05 gram cebione tablets daily or six teaspoonfuls of cal-c-tose daily). Since many of our underweight patients failed to gain weight unless they took more than the usual amount of this vitamin, we believe that it is an important factor in the treatment.

Patients with secondary anaemia were given liver or stomach extracts (lextron or reticulogen) with iron. To those with anoraexia and constipation, vitamin B_1 (betalin compound, betabion, or yeast concentrate) was administered. Patients with considerable bone atrophy were given calcium and cod-liver oil or haliver oil with viosterol.

Patients who showed a delayed blood-sugar removal were given a high-carbohydrate, low-fat diet with excess vitamin B. Three of our patients were more than twenty pounds overweight, and in each case the weight was reduced. Forty-three of them were more than ten pounds underweight and were put on high calorie diets in an effort to bring their weight up to normal.

With the exception of three patients who were confined to bed because of severe reactions during the period of treatment, the activities of our patients were not restricted, except that those who were ambulant were advised not to get overtired. Many of these were given special exercises, and a few had occupational therapy. Aspirin, or some other form of salicylate, was used for pain when indicated.

It is unlikely that toxic gold reactions are beneficial to the patient, and, during the past two years, we have tried various regimens in an effort to prevent them. We believe that the high-carbohydrate diet, plus liver extract and vitamin C, has been of some benefit in this respect and may account for the fact that we have not seen jaundice or purpura in our patients. In our experience, calcium gluconate in doses of 10 cubic centimeters of 10-per-cent. solution mixed with the gold before injection, as recommended by Williams, did not seem to aid in preventing reactions, but as yet our results are inconclusive.

To certain patients in whom skin reactions or irritations of the mucous membranes from the gold developed, we have given nicotinic acid in doses of from 150 to 300 milligrams daily. With this treatment the lesions improved rapidly, and the patients' tolerance to gold seemed to be increased; if mild reactions occurred, the gold treatment either was not interrupted or was resumed after a rest period of a few weeks.

TOXIC REACTIONS

Toxic reactions occurred in forty-four of our seventy patients who were treated with gold, and the total number of reactions was 108. There were no deaths among our patients, and in only four cases were the

reactions severe (three cases of exfoliative dermatitis and one of agranulocytosis), but six other patients were judged to be so hypersensitive to gold that the treatment was abandoned.

The reactions were as follows:

1. Skin reactions, seventy-six cases (pruritus, thirty-one; macular erythema, fifteen; erythema and desquamation, three; erythema and pigmentation, four; erythema and skin atrophy, one; urticaria, four; furuncles, four; conjunctivitis, five; styes, four; indolent ulcer, two; and exfoliative dermatitis, three).

2. Gastro-intestinal reactions, fifteen (stomatitis, four; colic, three; diarrhoea, five; and vomiting, three).

3. Kidney reactions, nine (albuminuria, five; casts, three; and oedema, one.

4. General reactions, five (fever, three; and chills, two).

5. Blood reactions, three (eosinophilia, two; and agranulocytosis, one).

Treatment of the reactions rests primarily on the facts that gold is cumulative, that certain individuals are hypersensitive to the drug, and that there is no specific antidote for the drug. We have tried intradermal injections of dilute solutions of gold and patch tests in an effort to identify patients who were hypersensitive to the metal, but these have not been of value in detecting patients who were hypersensitive to gold.

The most important factor in the treatment of reactions is to stop the administration of gold at the first sign of a reaction. This requires vigilance on the part of the physician; patients should be questioned concerning reactions before each weekly injection, and, under ideal circumstances, the blood and urine should be examined. If eosinophilia, or a drop in the number of white cells, or an albuminuria is found, the gold should be stopped, even though the patient has no complaints. Dryness of the skin and pruritus generally precede the onset of skin reactions and are warnings to interrupt the treatment. Our three patients with exfoliative dermatitis showed eosinophilia, and our patient with agranulocytosis showed a rapid drop in the number of white blood cells, so we regard these changes in the blood as signs of grave danger.

After mild reactions the patient is given a rest period of four weeks, and then the treatment is resumed with smaller doses of gold. When severe reactions occur, the treatment is abandoned. If the patient continues to have toxic reactions while receiving very small doses of gold, the treatment is abandoned.

The lesions caused by the gold are treated symptomatically. Calamine lotion, containing 2-per cent. phenol, or a colloidal bath is useful for the pruritus, and most of the mild reactions subside after a few days. The pigmentation after erythema lasted many months, and the indolent ulcers took several months to heal. Our patients with exfoliative dermatitis were treated with sodium thiosulphate, and the patient with agranulocytosis received pentnucleotide. All four recovered, but they were

severely ill. We believe that more care on our part might have prevented these reactions. It is especially to be noted that there is no safe period in gold therapy, and no patient can be considered as safe from a reaction regardless of how much gold he has taken previously and without difficulty. As a rule, the reactions occur early in the treatment, but they developed in some of our cases after the patients had received over 2 grams of gold. It is thus evident that gold should not be administered casually and that the physician must be on the alert to note the first evidence of a toxic reaction and to interrupt the treatment when it appears.

RESULTS OF TREATMENT

Of the two cases of proliferative arthritis following rheumatic fever, the disease was apparently arrested in one and in the other there was considerable improvement during the treatment, which, however, was discontinued on account of the severe toxic reactions.

In the four cases of proliferative arthritis which appeared to be due to the gonococcus, the gold treatment appeared to have little, if any, beneficial effect, and was not continued.

The arthritis was not improved in the two cases of lymphogranuloma, but in one of these the rectal condition showed marked improvement while under treatment. However, neither of these patients returned for a final examination, and the results are not known.

In the nine cases of spondylitis ankylopoietica, the gold therapy did not result in sufficient improvement to warrant continued administration of the drug. Consequently, its use was discontinued in treating this disease over a year ago, and sulfanilamide was substituted. This drug appears to have caused definite improvement in these patients, but it is still too early to state whether or not it will arrest the disease.

Of the fifty-three cases of atrophic arthritis (proliferative arthritis of unknown etiology, including seven cases of Still's disease) in two the arthritis was aggravated; in six there was no improvement; in seven there was improvement while under treatment, but the patients did not return for final check-up; in four there was slight improvement; in thirteen, moderate improvement; in eighteen, marked improvement; and in three the disease appears to have been arrested.

The signs of improvement were: disappearance of swelling in ten patients; diminution of swelling in twenty-five; increased movement in twenty-seven; disappearance of pain in twenty-one; diminution of pain in fifteen; decrease in the sedimentation rate in thirty-six of forty-six patients tested; and increase in the activity of thirty-seven of forty-seven patients checked for this factor. In regard to increased activity, twenty-two patients resumed their house work; four of the seven children returned to school; six resumed their occupations; and five merely stated that they were able to do more than they could before the treatment with gold was started. Thirty-six of our patients gained weight while under

treatment. This was desirable, since forty-three of them were underweight before therapy was commenced.

In addition to these tangible evidences of improvement, there was a marked change for the better in the morale of most of our patients, even in many who had toxic reactions.

DISCUSSION

We realize that an adequate number of controls is desirable in any experiment. It has not been possible for us to observe a series of controls over the requisite period, nor do we believe that it will ever be possible for us to do so. Also, it is to be noted that in a disease as variable in its course as is atrophic arthritis the number of controls must be large to be of value, and the observer must be carefully critical in formulating his conclusions.

It is to be noted, however, that the Arthritis Clinic at the Washington University School of Medicine has been in continuous operation since it was started by one of us over twelve years ago, and that during this period we have tried most of the drugs and vaccines which have been recommended and have seemed to us to have sufficient virtue to warrant a trial. Perhaps we have been hypercritical, but we have not been able to persuade ourselves that any single drug or vaccine or form of physical therapy has had a specific effect upon the clinical course of either atrophic or hypertrophic arthritis, although we have noted improvement in occasional patients under many forms of treatment. We have even written a few papers noting our failure to obtain beneficial results with various therapeutic agents, but we have not published them because, by the time our statistics had been compiled, the treatment was no longer popular. One would naturally question how much of the benefit obtained in the series of cases in this present report was due to the gold and how much was due to the vitamins, diets, and hematogenic substances which were used during the period in which the patients were under treatment with gold. We would like to state that we have used these same regimens and accessory food substances in patients who were not receiving gold, and we have not been able to determine that they definitely affected the course of the disease.

In the light of our experience we realize that we are not able to predict what course the disease will pursue in any individual patient with atrophic arthritis, but, given a group of fifty such patients in each of whom the disease is well established, we believe that we have a fair idea of what will happen to them under any form of treatment which we have used in the past. Bearing this in mind, it is our opinion that gold therapy has definitely ameliorated the course of the disease in the majority of our patients with atrophic arthritis in whom it has been given a fair trial, and this is true regardless of the duration of the disease. In old, but still active cases with permanent damage to the joints this damage remains, but the inflammation subsides just as well and as frequently as it does in

those cases of recent origin. We believe, however, that treatment with gold salts is particularly applicable to early cases of proliferative arthritis and that by its use it may be possible to arrest the disease before severe and permanent crippling has developed.

It is to be noted that gold therapy will not cure every case and is not a royal road to the cure of atrophic arthritis, as the treatment is fraught with danger and must be continued over a period of months or even years if the maximum benefits are to be obtained. However, we have no hesitancy in recommending it for those patients who have the true disease and to whom it can be given under proper supervision, but we condemn its use in patients with rheumatic pains of various sorts, which may be expected to yield to less dangerous treatment.

We hope that the future will give us gold preparations which are less toxic and just as efficient as myochrysine or that we may discover a means of preventing the reactions without decreasing the efficiency of the drug.

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ACUTE OSTEOMYELITIS OF A VERTEBRAL BODY FOLLOWING COMPRESSION FRACTURE

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The following case was unusual as the title of this report indicates. The primary lesion was the ordinary type of compression fracture, while the secondary lesion was a superimposed hematogenous infection localized within the fractured vertebral body.

CASE HISTORY

A Mexican, aged sixty, was brought into the Santa Barbara Clinic by his employer on December 23, 1937, after having fallen eight feet from a ladder while trimming a hedge. He was at once sent to the hospital. Roentgenograms revealed a marked compression fracture of the second lumbar vertebra with anterior displacement of the upper anterior portion of the body (Fig. 1). The intervertebral discs above and below were represented by perfectly normal shadows. There were no cord symptoms. The next day there was moderate disturbance of the sympathetic system with moderate bowel distension. The chart on that day showed a slight elevation of temperature, normal pulse, a white blood count of 13,500, and negative urine. This temperature of 100 degrees Fahrenheit and the elevated white blood count were, it was felt, due to the recent fracture. He was treated on a modified Rogers bed, in recumbency for three days and then with gradual hyperextension.

His progress was satisfactory, except for the usual pain in the back, until January 5, thirteen days after the accident. On this day he had a chill accompanied by a temperature of 102.0 degrees, an elevation of the pulse rate, and changed breath sounds. A mild pneumonic process was suspected, but roentgenographic examination of the chest was negative. As seen in retrospect, this change probably represented the start of the osteomyelitic process. Pain and tenderness were present in the right paravertebral region opposite the second lumbar vertebra at this time, but these findings were not considered abnormal. A second chill on January 9, four days later, was accompanied by a reduction of temperature from 102 degrees to practically normal, where it remained, except for occasional rises to 100 or 101 degrees, until March 6, ten weeks after onset. During this period a check-up roentgenogram of the spine on January 21 had shown a fairly good reduction of the fractured vertebra and no abnormal signs in either body or discs (Fig. 2). Physiotherapy, consisting of muscle setting and massage and later bed exercise, was given, so that on February 25 the patient was allowed to stand with a Taylor back brace.

During this period of intermittent fever, the urine was repeatedly checked and found normal; the chest and abdomen were repeatedly examined by a competent internist; and the blood was examined for malaria. On March 6, the temperature assumed a definitely septic swing with corresponding fluctuations in the pulse. The temperature gradually mounted to 102.6 degrees. With Malta fever ruled out, and in view of a negative sputum test, negative findings in the chest and abdomen except for pain and tenderness in the flanks and in the spine proper, no cord signs, consistently negative urine, and a negative Wassermann reaction, the attending surgeon and physician were somewhat puzzled. It was finally considered that there must be additional pathology in the spine, and further roentgenograms were taken on March 24 (Fig. 3). These revealed an anterior displacement of the upper anterior fragment, trabecular destruction, and irregular loss of calcium throughout the greater portion of the body. There was faint bony debris in front of and below the body, and a partial destruction of the disc between the second and third lumbar

vertebrae was disclosed. The diagnosis of osteomyelitis of the second lumbar vertebra superimposed on a compression fracture was made after consultation between the roentgenologist and the orthopaedic surgeon.

Because of the foul appearance of the teeth, it was suspected that the hematogenous bone infection was streptococcal, and sulfanilamide therapy was instituted. The temperature began to drop at once, and within a few days the peak was 99.4 degrees.

The insurance carrier became very much interested in the case about this time and sent a consultant, who felt that if the condition was not a Charcot's joint, it certainly was not an osteomyelitis. At his suggestion, a spinal-fluid examination was done. The Kolmer test (quantitative) was negative. The colloidal-gold test showed a very high and sustained curve, but, as this finding was in direct opposition to all clinical and other laboratory findings, it was probably the result of contamination of the spinal fluid with blood. A second agglutination for undulant fever was negative in all dilutions. A catheterization for residual urine disclosed only five cubic centimeters. Although the catheterization was done carefully, a severe pyelocystitis developed with a rise in temperature to 104 degrees Fahrenheit, and casts, albumin, and pus were present in the urine, which hitherto had been completely negative. This condition continued for a week, when the patient

FIG. 1

Compression fracture of second lumbar vertebra.

FIG. 2

Reduction of fracture of second lumbar vertebra.

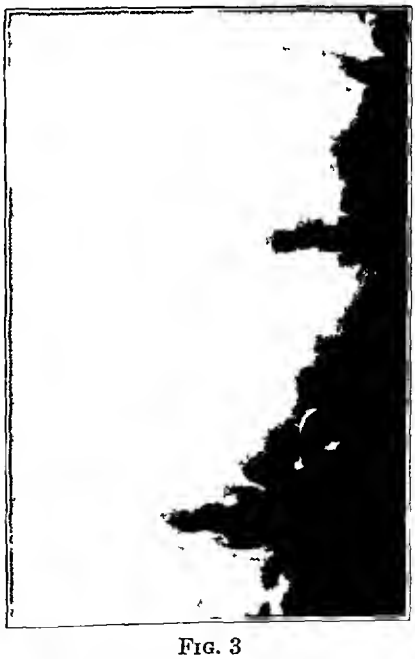

FIG. 3

Acute osteomyelitis of the injured vetebral body.

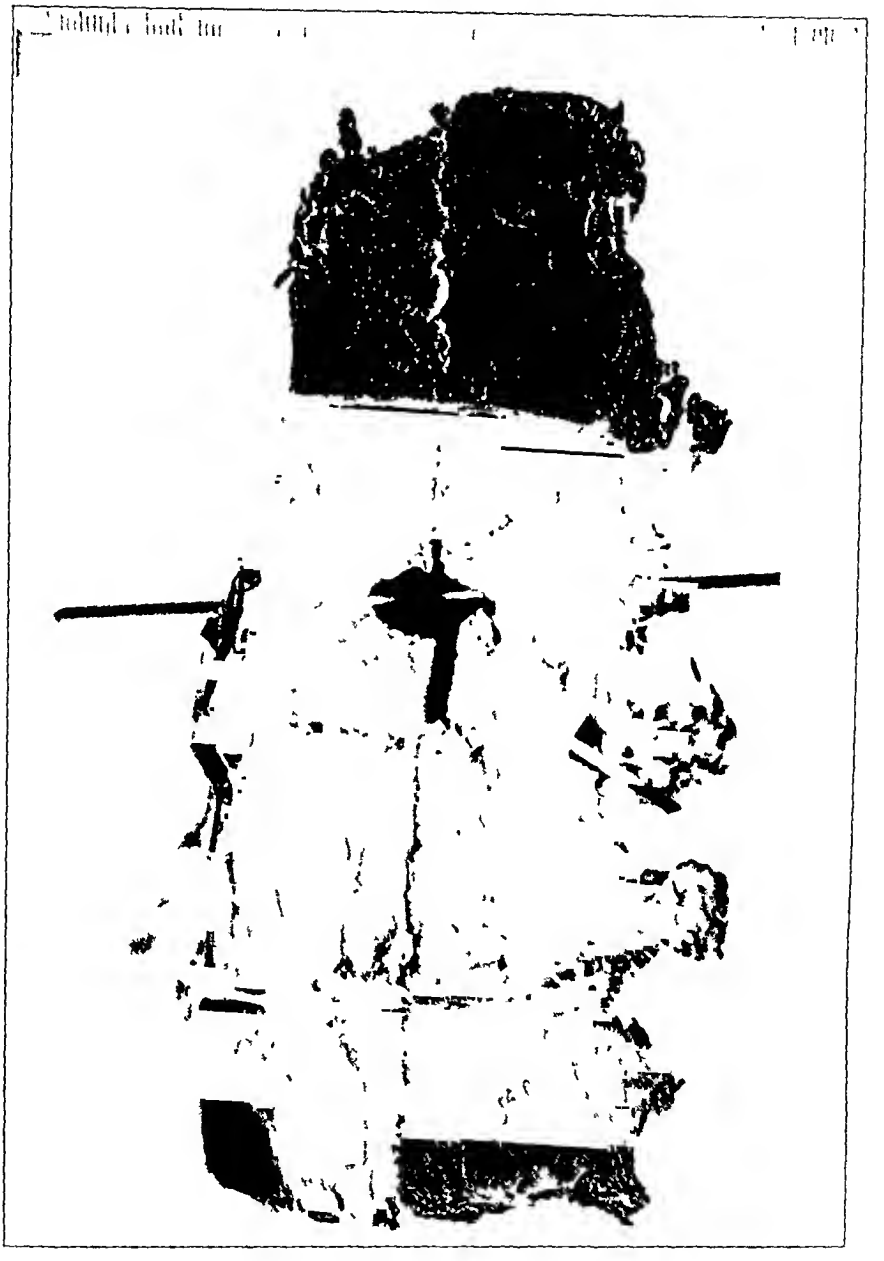

FIG. 4

Specimen showing sinus openings into shell of second lumbar vertebra.

had a sudden chill. Coma developed, and the temperature rose to 106 6 degrees. After twelve hours, the patient died of terminal pneumonia and sepsis.

The post-mortem examination revealed an induration of the retroperitoneal soft tissue with a marked anterior prominence over the lumbar spine. Incision of this tissue released a large quantity of thick greenish-yellow pus The abscess extended down along the psoas muscles on each side as far as Poupart's ligament. The removal of this thickened retroperitoneal tissue exhibited the lumbar spine, bathed in pus. Four sinus openings led directly into the cavity occupying the shell-like remains of the second lumbar vertebra. The specimen was removed *in toto* (Fig. 4), and on sagittal section (Fig. 5) there was seen a complete hollowing out of the body with just a portion of the upper plate

and posterior and lateral walls remaining. The shell was reinforced in front and on the sides by numerous struts of new bone, so that the original body dimensions were well preserved. The posterior wall of the body was partly eroded and a sinus, one centimeter in diameter and containing a small sequestrum, had allowed pus to bathe the external surface of the dura mater. This was thickened and oedematous. The internal surface of the arachnoid was injected and granular. The cord itself showed no gross changes. All other organs and tissues save the lungs, kidneys, and dura were negative. The lungs showed an irregular area of hemorrhagic consolidation; the kidneys, an acute pyelonephritis; and the dura, a moderate localized meningitis.

Microscopic examination of sections from the body of the second lumbar vertebra "shows the bony vertebral trabeculae scattered in an altered marrow. Prominent among the cells here are large giant cells resembling foreign-body giant cells. Their foreign-body nature is substantiated by the finding of bluish amorphous debris in their

FIG. 5

Specimen sectioned sagittally, showing hollow body of second lumbar vertebra with numerous sinus openings.

cytoplasm, which resembles necrotic fragments of bone or cartilage. Many of the bony trabeculae remain unaltered. Others show the saw-tooth edges of previous osteoclastic action. The trabeculae remain viable, however, as evidenced by the state of preservation of the osteocytic nuclei in the trabeculae. Occasionally is seen a delicate noncalcified strand of bony matrix lined with flattened osteoblasts. This is interpreted as new bone. At the edge of one section is a dense layer of fibrous tissue resembling a portion of intervertebral disc. Section through the pyogenic membrane lining a sinus cavity shows an exudate of fibrin and neutrophiles."

The diagnosis by macroscopic and microscopic examinations was: osteomyelitis of the second lumbar vertebra with retroperitoneal cellulitis; acute pyelonephritis; bronchopneumonia; meningitis; myocardial hypertrophy.

Kulowski reported that of a large series of sixty cases of pyogenic osteomyelitis of the spine in only eight was there a history of direct and serious injury to the spine as a part of the pathogenesis. He further stated: "Trauma is recorded in about 30 per cent. of all cases of pyogenic osteomyelitis and its significance must be recognized." This percentage must include, of course, many minor injuries similar to those recorded in the onset of other types of osteomyelitis.

The relation of trauma to osteomyelitis of the spine has been discussed by Steindler. He states: "Trauma seems to be of some etiological significance, in so far as it produces a point of lessened resistance and thereby favors the colonization of the micro-organism. . . . However, to establish connection between trauma and osteomyelitis, it would first be necessary to prove the occurrence of the injury together with the fact that the patient immediately before showed no signs of fever, pain, swelling, etc., and, secondly, it must be shown that the interval between the accident and the first symptom of osteomyelitis was marked by local pain and impairment of function as well as by general symptoms." The case which has been described fulfills these criteria almost to the letter.

In a very comprehensive article on osteomyelitis of the vertebrae, Wilensky described the pathogenesis of osteomyelitis in a vertebral body with great clearness: "The various accessory causes, such as trauma, that determine the localization of a secondary focus of infection—fixation point—in a given bone, are associated with accidents in the local circulation which facilitate blocking of any bacterial thrombus-embolus." In the case reported we have this very situation. The compression fracture with its attendant blood clot, the disorganized circulatory system in the vertebral body, and the crushed bony debris furnished an ideal *locus minoris resistentiae* for the development of the typical medullary lesion of osteomyelitis, such as is seen in the metaphyses of long bones, with cavitation, sequestration, and soft-tissue abscess formation.

In discussing the pathological anatomy of vertebral lesions, Kulowski stated: "The type of lesion in the hematogenous forms is variable and may be destructive and ulcerative, solitary, and localized, primarily in the disc alone, in the disc and the contiguous bony structures, or even in the subperiosteal area. The primary focus is practically always in the bone marrow . . . or in the disc." It is to be noted, however, that his illustrative cases show early if not primary disc involvement and relatively

little destruction in the bodies. Henry presented a patient with destruction of the body of the fourth lumbar vertebra following what might well have been a mild compression fracture or at least a derangement of the architecture in the body sufficient to cause hemorrhage, thus furnishing a nidus for the blood-borne infection. The roentgenograms in the author's case resemble those of Henry's rather closely in that the medulla of the vertebra was apparently the primary point of attack.

Patton reported the onset of an acute osteomyelitis in a man who had slipped while carrying a sack of cement. Roentgenograms were not taken until twenty days later, but, as the man complained of localized pain at the site of the later development of the bone infection, it is only fair to suppose that a derangement of the bone structure or disc structure paved the way for the subsequent thrombosis and infection.

Compere and Garrison presented two cases of pure pyogenic infection, but in each of these cases the intervertebral discs were primarily destroyed, while the bodies were attacked secondarily and then only to a limited extent.

Selig reported a case of metastatic hematogenous infection with bacillus proteus involving one intervertebral disc and the two adjacent body margins.

Klein, in a discussion of the bacteriological picture in these cases, listed many different organisms as causative factors and stated: "One cannot dismiss the diagnosis because a bacterium not generally encountered in osteomyelitis has been obtained in culture." He reported that the following organisms had been found in osteomyelitis of the spine: staphylococcus aureus and albus, streptococcus pyogenes, bacillus typhosus, micrococcus tetragenus, bacillus paratyphosus A, and bacillus perfringens. He then adds from his own series streptococcus viridans, pneumococcus types I, III, and IV, and Friedländer's bacillus.

Kulowski and Vinke described a case of undulant-fever spondylitis caused by an infection with brucella melitensis. Archer reported a similar case.

In a report of seventeen cases collected from the records of the New York Orthopaedic Dispensary and Hospital, Smith pointed out that tuberculosis is often a confusing factor in the diagnosis of osteomyelitis of the spine, especially in those benign cases which have a gradual onset. In eleven of these seventeen cases of proved osteomyelitis, the original diagnosis, made in his own hospital or by other competent orthopaedic surgeons, was tuberculosis.

This is not surprising when we consider that in most cases, especially those with a gradual onset, osteomyelitis of the spine involves one or both intervertebral discs early, thus simulating tuberculosis. The important factor in differential diagnosis in these chronic cases of a month or more is the presence of regeneration and new bone, which is not commonly seen in tuberculous lesions. In the acute cases the diagnosis can be made on clinical and laboratory evidence.

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THE USE OF SKELETAL TRACTION AS A PRELIMINARY PROCEDURE IN THE TREATMENT OF EARLY CONGENITAL DISLOCATION OF THE HIP

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From the Shriners' Hospitals for Crippled Children, St. Louis Unit

Preliminary skeletal traction in certain cases of congenital dislocation of the hip is not a new procedure. Abbott in 1921 made use of Steinmann-pin traction in the treatment of older children with congenital dislocation of the hip, and Allison described a similar method for use in young adults. Dickson has used skeletal traction preliminary to his shelf operation for a number of years, and in our own Clinic we have employed skeletal traction in treating this condition in the older children since the Hospital opened in 1924. However, prior to 1933, the writer has found no reference in the literature relative to the use of skeletal traction as a preliminary procedure to either open or closed reduction, in treating children under seven years of age. In a paper read before the Section on Bone and Joint Surgery in 1932 at a meeting of the Southern Medical Association, the author reported the use of wire traction as a preliminary procedure in the treatment of congenital dislocation of the hip in the younger age group. At that time the cases were too recent to even hazard a guess as to the end results, but it was concluded that the use of skeletal traction was of distinct advantage in that it gradually overcame resistant soft parts, prevented serious damage to muscles, ligaments, nerves, and vessels, and eliminated the trauma incident to either open or closed reduction.

Prior to the introduction of wire traction, skeletal traction was effected either by some form of Steinmann pin or by one of the several varieties of calipers. A Steinmann pin of sufficient diameter to resist bending is too large to drill through the shaft of the femur in a young child. The use of calipers at any age is fraught with danger, and their employment in growing children cannot be too severely condemned. Consequently, skeletal traction was not applicable in the younger age groups until after the use of wire was popularized.

Perhaps on first thought the use of skeletal traction in young children might be regarded as a radical procedure. However, on careful analysis, it is far less radical than the old classic procedure of forcible stretching and massaging of those structures which hinder manipulative reduction. It is most unreasonable to assume that structurally shortened muscles, tendons, ligaments, and joint capsule can be stretched and relaxed by force under an anaesthetic without producing considerable damage to the structures involved. On the other hand, if these soft parts are not thoroughly relaxed, the actual reduction itself must be effected through

the exertion of tremendous force. In consequence, the already underdeveloped head of the femur is further damaged, not only at the time of the actual reduction, but for a considerable time thereafter, because of the continuous jamming of the head against the acetabulum after the plaster is applied. If, then, the mechanical obstacles can be gradually but certainly and effectively stretched and relaxed by preliminary skeletal traction, the actual placement of the head of the femur into the acetabulum can be accomplished with no trauma whatever, and the post-reductive intra-articular pressure can be eliminated.

In those cases in which we are certain that the acetabulum is too shallow or its roof too vertical to hope for permanent reduction, and in which open operation is definitely indicated, it may be argued that preliminary skeletal traction is a waste of time and a totally unnecessary procedure. However, if open reduction is attempted without first pulling the head of the femur well down below the superior rim of the acetabulum, radical cutting of resistant soft parts, excision of folds of capsule, and, in some instances, tenotomies or open section of the hip flexors and adductors must be done before the head can be brought down even close to the acetabulum. Even after all resistant soft parts have been sectioned or removed, the use of a hip skid and considerable force are required to lever the head in place before reduction can be effected. This damages the head fully as much as forcible closed manipulation, and, after reduction, the head must take the added punishment of continuous intra-articular pressure. Under ideal conditions, in young children open operations are severe tests of their endurance, and any preliminary procedure which obviates the necessity both of radical cutting of soft parts and of the forcible use of the hip skid should be a distinct advantage from all angles. Preliminary traction also has the advantage of eliminating the post-reductive intra-articular pressure of the head against the acetabulum during the immobilization period, and, when acetabular recon-

FIG. 1-A

December 22, 1933. Congenital posterior dislocation of the left hip in a female, aged four years. The right knee was in neutral position, and the left knee was in 45 degrees of internal rotation when the roentgenogram was taken.

structions and shelving operations are done, preliminary skeletal traction avoids the tendency to upward displacement so frequently seen when the head has not been adequately pulled down opposite the center of the acetabulum.

There have been many and various modifications of the apparatus originally described by Kirschner for the application of wire traction. Some are good, some are bad, and some are merely indifferent. The underlying principles, however, are the same, no matter what type of apparatus is used. The wire must be drilled through the bone, and some

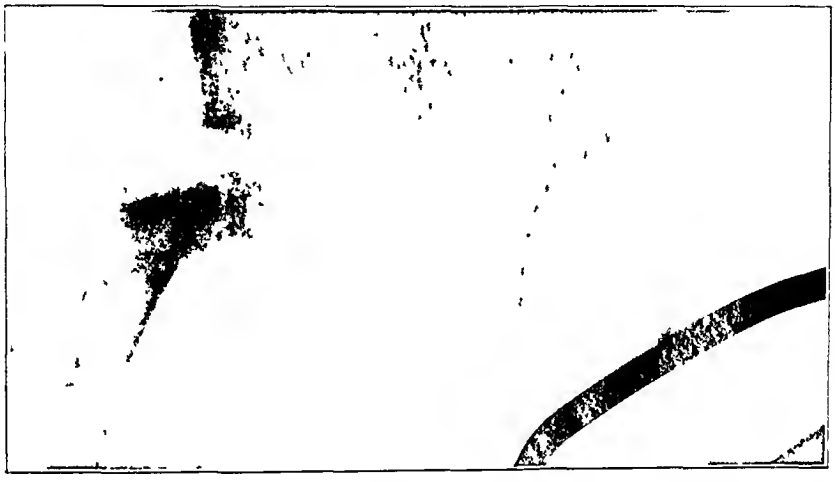

FIG. 1-B

January 30, 1934. Twelve days after application of fifteen pounds of wire traction. Spontaneous reduction occurred. Torsion was operatively corrected three months later, but acetabular reconstruction was purposely not done.

FIG. 1-C

November 23, 1938. Four and one-half years after resumption of weight-bearing. Functional result excellent. Anatomical result poor, because of an inadequate acetabulum. The acetabulum was not reconstructed in this case in order to prove that acetabula do not deepen to any appreciable degree after reduction.

FIG. 2-A

August 26, 1929. Bilateral congenital posterior dislocation of the hip in a male, four years of age Exact position of the knees unknown in this film, but subsequent roentgenograms showed no torsion on the right and 45 degrees of torsion on the left

FIG. 2-B

November 4, 1930. Both knees straight up Right hip was treated with twenty pounds of wire traction and open reduction. Left hip was treated with twenty pounds of wire traction, and spontaneous reduction took place. The femoral torsion on the left was purposely not corrected.

FIG. 2-C

June 10, 1937. The left hip, in which torsion was purposely not corrected, is now in a position of complete anterior transposition and upward subluxation The right hip has practically normal function, and is painless

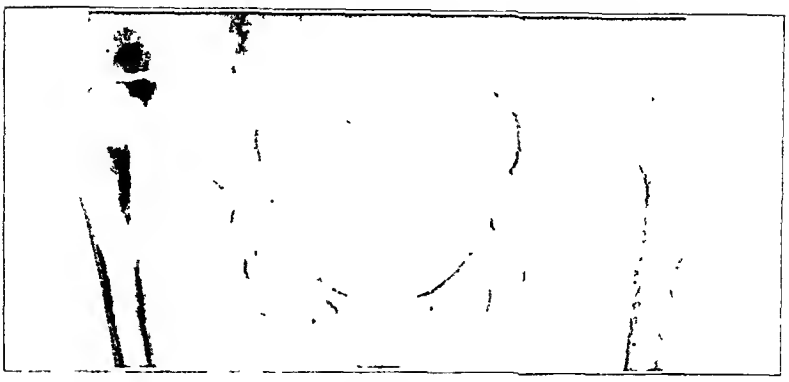

FIG. 3-A

August 23, 1931. Bilateral congenital posterior dislocation of the hip in a male, five years old. Both knees in neutral position. Note bilateral femoral torsion.

FIG. 3-B

May 24, 1933. Both knees in 45 degrees of internal rotation. After treatment of the right hip with traction, open reduction, and acetabular reconstruction and after treatment of the left hip with traction, followed by spontaneous closed reduction. Torsion on the right was purposely left uncorrected; torsion on the left was later corrected by supracondylar osteotomy.

FIG. 3-C

December 22, 1938. Both knees straight up. The right hip is in a position of partial anterior transposition with the head pointing straight forward in the groin; femoral torsion is still present. The dislocation of the left hip is well reduced; there is a good angle to the neck, but the acetabulum is inadequate. This patient is now in the hospital for acetabular reconstruction.

FIG. 4-A

October 21, 1932. Congenital posterior dislocation of the right hip in a male, aged twenty-eight months.

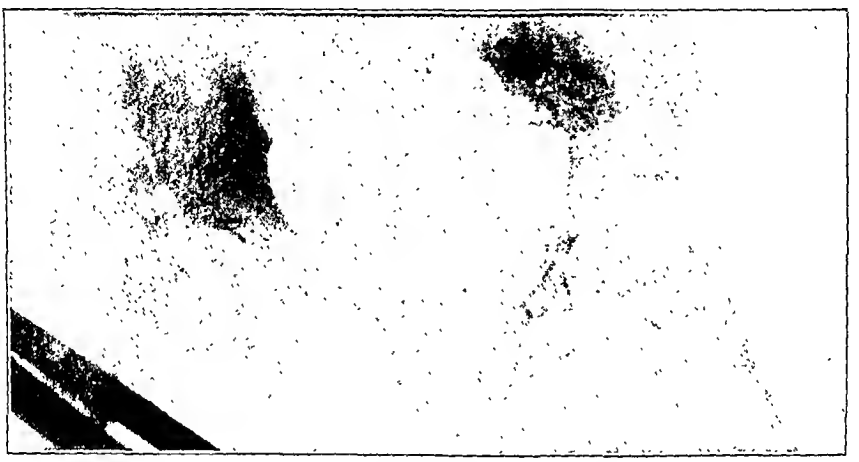

FIG. 4-B

November 28, 1932. Eleven days after application of sixteen pounds of wire traction. Spontaneous reduction without anaesthesia occurred.

FIG. 4-C

March 29, 1933. Immediately after removal of plaster. The right knee is in about 10 degrees of internal rotation. There was not enough femoral torsion to justify osteotomy.

form of appliance must be used to tighten the wire and to hold it under high tension in order to prevent bending when traction is applied. None of the available types of apparatus appealed to the writer. There were too many wrenches, bolts, nuts, wire guides, and wire holders to satisfy one who has always believed that the simple way is the easy way. Consequently, a very simple but effective traction bow was designed, and from wood patterns Lynite sand castings were made in four different sizes. Stainless-steel (18–8) wires, .080 of an inch in diameter, were substituted for the usual Kirschner wire of a diameter of .0625 of an inch. These wires were cut to fit the individual bow and threaded on each end, so that tension in the wires could be obtained by tightening ordinary bicycle-spoke nipples on the ends of the wires against the bows. An ordinary trocar, with a bore just large enough to admit the wire, completed the necessary equipment for use of wire traction.

The technique of inserting wire and applying traction is as follows:

1. The extremity to which traction is to be applied receives a routine twenty-four-hour orthopaedic preparation from the groin to the toes inclusive.

2. The patient is given a light anaesthetic, and sterile drapes are applied with the involved extremity free.

3. The trocar is inserted through the soft parts directly to the shaft of the femur on the lateral aspect of the thigh at a point about one-half to three-fourths of an inch proximal to the level of the adductor tubercle.

4. The trocar is gently pointed upward to locate the anterior border of the femoral shaft, then downward to locate the posterior border, and finally the sharp tip of the trocar is firmly placed against the femur at a point estimated to be the center of the shaft. (It is very important to

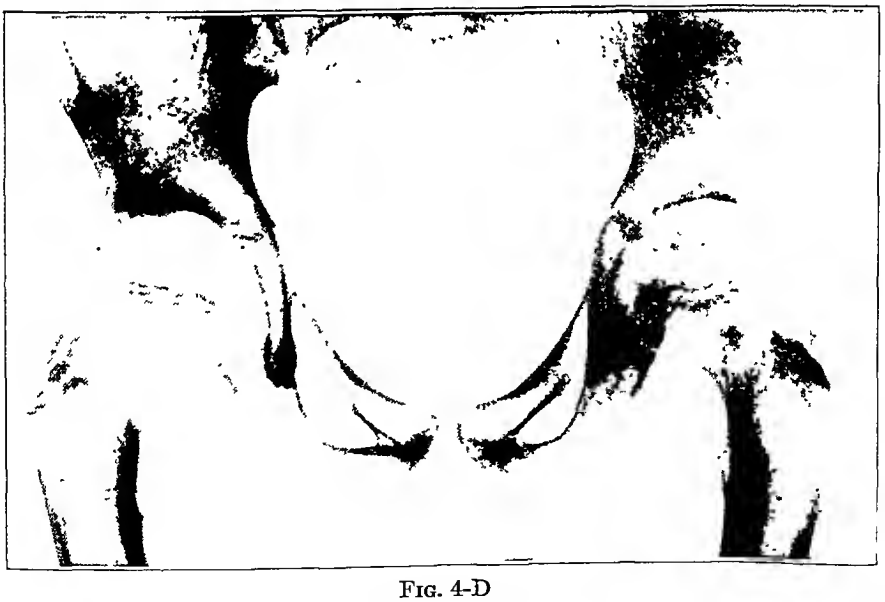

FIG. 4-D

November 15, 1938. Five and one-half years after resumption of weight-bearing.

FIG. 5-A

February 26, 1937. Congenital posterior dislocation of the left hip in a female, thirty months old. Both knees in neutral position.

FIG. 5-B

March 10, 1937. Six days after application of ten pounds of wire traction. Spontaneous reduction occurred. Femoral torsion corrected later.

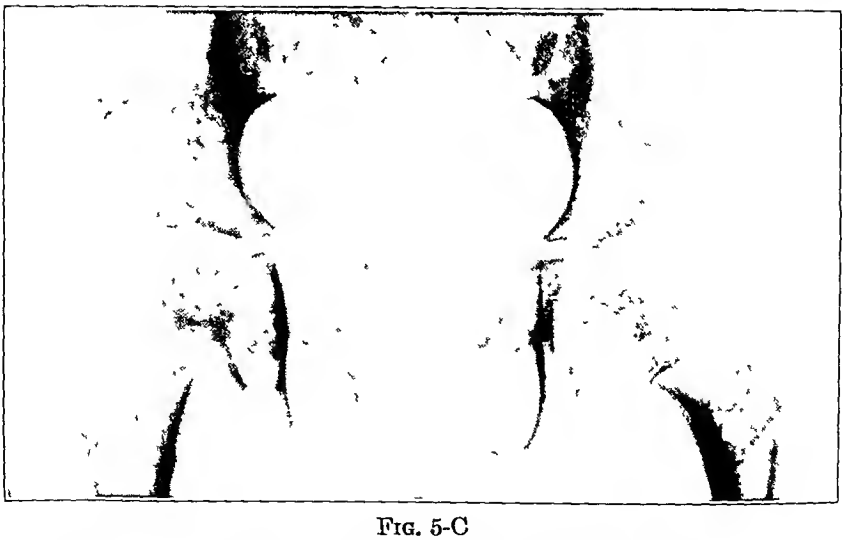

FIG. 5-C

October 29, 1938. One year after resumption of weight-bearing.

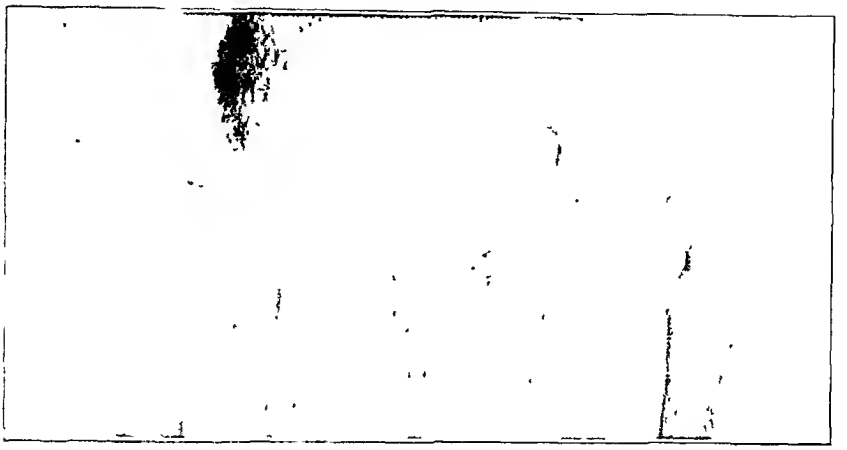

FIG. 6-A

December 4, 1936. Congenital posterior dislocation of the left hip in a female, aged twenty months. Both knees straight up.

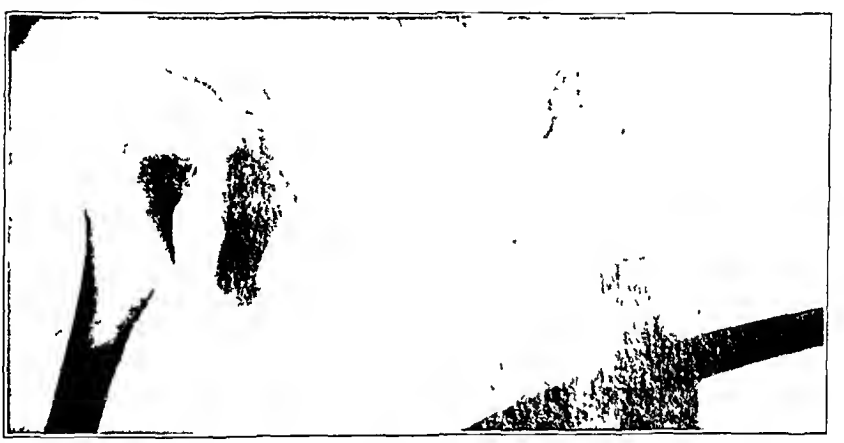

FIG. 6-B

February 6, 1937. Six days after application of ten pounds of wire traction. Spontaneous reduction occurred. Femoral torsion corrected later.

FIG. 6-C

November 21, 1938. One year and four months after resumption of weight-bearing.

point the beveled opening of the trocar up or down the long axis of the bone. If this opening points anteriorly or posteriorly, there will be a tendency for the wire to ride over or under the shaft of the femur.)

5. The trocar is held firmly against the flat surface of the shaft of the femur and checked for position to make sure that the wire will penetrate the bone in the proper direction.

6. The wire is then drilled through both cortices of the femur; the trocar is removed; and the drilling process is completed.

7. Sterile dressings are applied. The traction bow is slipped in place over the ends of the wire, and the nipples are then threaded on each end of the wire and firmly seated against the bow with sufficient tension to prevent bending of the wire when the weight is applied.

8. The patient is then put to bed on a Bradford frame, and weight and pulley traction is applied to the bow. The foot of the bed is elevated, and body weight is used as countertraction.

Well-leg countertraction has been used, but has been found to be less satisfactory than simple elevation of the bed, especially in very young children. In cases of bilateral congenital dislocation of the hip, of course, well-leg countertraction is out of the question.

In children under four years of age, the initial weight used is about ten pounds, and additional weight is added according to the individual requirements of each patient. The descent of the head should not be too rapid. Consequently, weight is added or subtracted, so that the head will be completely pulled down in about ten days or two weeks. The level of the trochanter should be checked manually each day, and, after the head is well down, the position is checked roentgenographically. The amount of traction is reduced, so that there will be just enough pull to prevent upward displacement of the head, and the adjusted traction should be continued at least ten days or two weeks after roentgenographic examination shows the head to be well down opposite the lower half of the acetabulum.

In some of the early cases, the head was completely pulled down in from four to seven days, and reductions were immediately done, but, in the light of past experience, it is now felt that an average of two weeks should be required to pull the head down, and that the stretched soft parts should be kept in this state at least another ten days or two weeks before reduction and plaster fixation are effected.

In judging as to whether or not the head has descended sufficiently, it is to be remembered that the head and acetabulum in young children are largely cartilaginous and only the osseous tissue is visualized in the roentgenogram. Therefore, it is absolutely necessary to keep pulling until what one sees of the bony portion of the head is on a level with or slightly below the level of the center of the acetabulum. Unless this condition obtains, the head has not completely descended, nor are the soft parts, particularly the inferior capsule, adequately stretched.

In several of the patients over five years of age, it has been necessary

to tenotomize the hip flexors and adductors and to use twenty pounds of traction for as long as a month before the head has completely descended.

In those cases in which it is certain that the acetabulum is too shallow or its roof too vertical to hope for permanent reduction, and in those cases in which closed reduction cannot be effected without an anaesthetic, open operation is indicated. It has been claimed that in properly reduced dislocations of the hip, the acetabulum will deepen and develop once the head has been put in place. This condition has purposely not been remedied in several cases in order to prove that an inadequate acetabulum will not change to an adequate acetabulum merely by reducing the dislocation. Figures 1-A, 1-B, and 1-C are illustrative of such a case.

Femoral torsion, if it exists, should always be corrected. It has been said that this condition will correct itself in time under weight-bearing, but this has not been our experience. This femoral torsion has purposely been left uncorrected on one side and operatively corrected on the other side in several cases of bilateral dislocation. In every instance, the femoral torsion has failed to correct itself and the end result has been a hip that is anatomically quite unsatisfactory. In one patient, first anterior subluxation and then complete upward displacement occurred on the uncorrected side. In the other patients, clinically and roentgenographically the head points anteriorly and can be palpated in the groin in an anterior position. (See Figures 2-A through 3-C.)

In several instances traction was applied with the wire through the tibia, but this was not satisfactory. In the hips so treated the head could not be pulled down as readily. More weight was required, and the patients complained of pain in the knee. The knee joint in these cases showed some hypermobility for several months after resumption of weight-bearing. Therefore, it is recommended that the wire always be placed through the lower end of the femoral shaft, as no knee abnormalities have been noted, nor have the patients complained of pain when so treated.

The only complication was due to a technical mistake. The wire was drilled too far anteriorly, and engaged only in the anterior cortex of the femur. In a few days it pulled out of the bone into the soft parts and lacerated the skin of the thigh for a distance of three-fourths of an inch. In this particular case the skin laceration was allowed to heal, the wire was reinserted through the center of the shaft, and the head was pulled down without difficulty.

One very striking observation has been the speed with which joint motion has returned after the removal of plaster, even in the hips which have been operated upon. In only two instances has there been any residual stiffening, and even in these cases the limitation of motion has not been of sufficient degree to interfere with the patients' activities.

SUMMARY

To date, skeletal traction has been used as a preliminary procedure to either open or closed reduction in twenty-seven children under the age

of seven years with posterior congenital dislocation of the hip. In eleven cases the deformity was bilateral, making a total of thirty-eight hips treated.

FIG. 7-A

January 16, 1931. Congenital posterior dislocation of the right hip in a female, aged six and one-half years. Knees straight up. Note false acetabulum, inadequate true acetabulum, and practically normal angle of the femoral neck.

FIG. 7-B

December 14, 1938. Seven and one-half years after treatment. The head was pulled down with twenty-five pounds of skeletal traction. This was followed by open reduction and acetabular reconstruction.

There have been twenty-nine spontaneous closed reductions without anaesthesia and nine open reductions, whereas, previous to the use of skeletal traction, 80 per cent. of the writer's cases in children under seven

FIG. 8-A

November 16, 1934. Congenital posterior dislocation of the left hip in a female, three years of age. Note femoral torsion.

FIG. 8-B

Four years after treatment with ten pounds of wire traction. Spontaneous reduction occurred and the femoral torsion was corrected by operation.

years were treated by open operation. The acetabulum has been reconstructed in fifteen instances, purposely not reconstructed in four instances, and should have been reconstructed in three additional cases. There-

FIG. 9-A

October 6, 1933. Congenital posterior dislocation of the left hip in a male, aged eleven months.

FIG. 9-B

August 31, 1938. Four years and ten months after spontaneous reduction, which was preceded by the application of fifteen pounds of skeletal traction for a period of nine days. Both knees straight up.

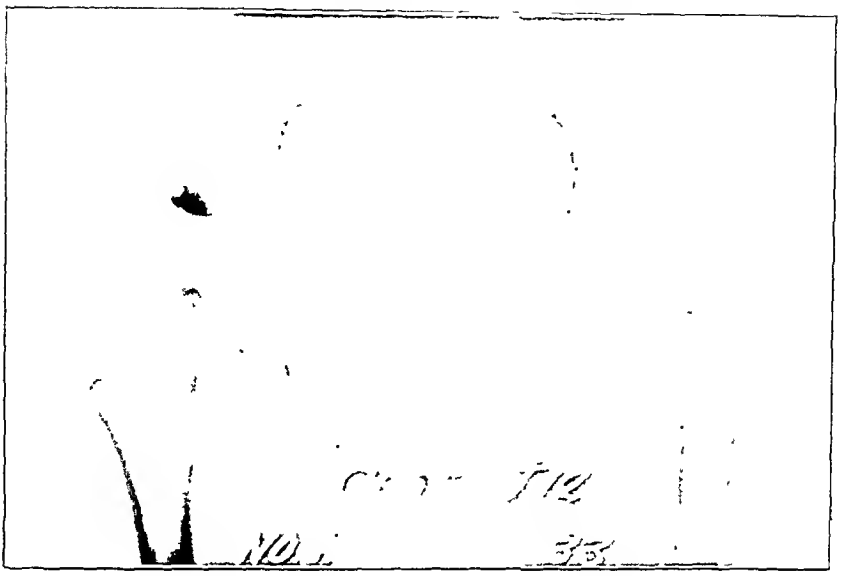

FIG. 10-A

February 14, 1933. Congenital posterior dislocation of the left hip in a female, aged five years. Both knees in neutral position. One closed reduction and one open reduction had been performed at another clinic, with redislocation in each instance.

FIG. 10-B

Five and one-half years after treatment, which consisted of the application of twenty pounds of preliminary skeletal traction, followed by spontaneous closed reduction without anaesthesia, and correction of femoral torsion by supracondylar osteotomy.

FIG. 11-A

April 25, 1937. Bilateral congenital posterior dislocation of the hip in a female, aged thirty-two months. Both knees in neutral position.

FIG. 11-B

May 7, 1937. Eleven days after application of ten pounds of wire traction to the right hip. Spontaneous reduction occurred.

FIG. 11-C

November 23, 1937. Twelve days after application of ten pounds of wire traction to the left hip. Spontaneous reduction occurred, and femoral torsion was corrected later.

fore, of the thirty-eight hips, only sixteen had an adequate acetabulum.

Femoral torsion has been corrected in twenty-eight instances and purposely not corrected in five. Consequently, there were only five cases in which femoral torsion was not present in sufficient degree to warrant operative correction.

There are now five cases in which the hip is still in plaster. In each case the reduction is satisfactory, the acetabulum is adequate, and the femoral torsion is either corrected or to be corrected. If past results can be relied upon, these patients should have entirely satisfactory end results, but, because this fact cannot be predicted with certainty, these five cases are not included in the analysis of the results.

Neither is it fair to include the five cases in which femoral torsion, inadequate acetabula, or both, were purposely not corrected. The five hips so treated proved to the writer's satisfaction that femoral torsion of any appreciable degree will not correct itself, and that an inadequate acetabulum will not deepen sufficiently under weight-bearing.

Of the remaining twenty-eight cases, there are twenty-five with entirely satisfactory anatomical results,—in each case the head is well within the acetabular cavity, the acetabulum is adequate, and the angle of the neck of the femur is practically normal. There are three cases in which reduction is adequate and no torsion exists, but in which the acetabulum is of the borderline type. Functionally these three hips are still excellent, but each should have an acetabular reconstruction to prevent another later upward subluxation of the head.

FIG. 11-D

November 16, 1938. Seven months after resumption of weight-bearing. Both knees in neutral position.

FIG. 12-A

October 9, 1934. Bilateral congenital posterior dislocation of the hip in a female, three years of age.

FIG. 12-B

February 19, 1935. The right hip was treated with sixteen pounds of skeletal traction over a period of three weeks. Spontaneous reduction occurred. The left hip is still untreated.

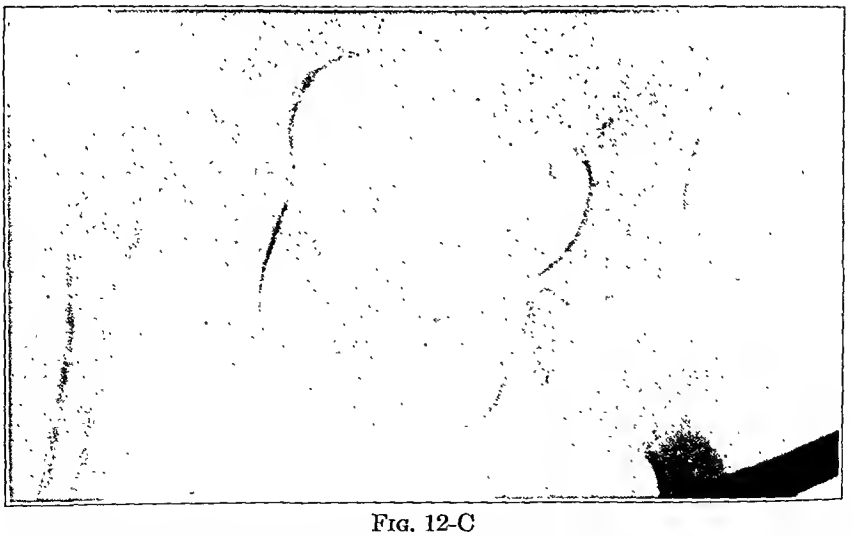

FIG. 12-C

March 15, 1935. Eight days after application of twelve pounds of wire traction to the left hip. Spontaneous reduction occurred. Femoral torsion on each side corrected before weight-bearing was instituted.

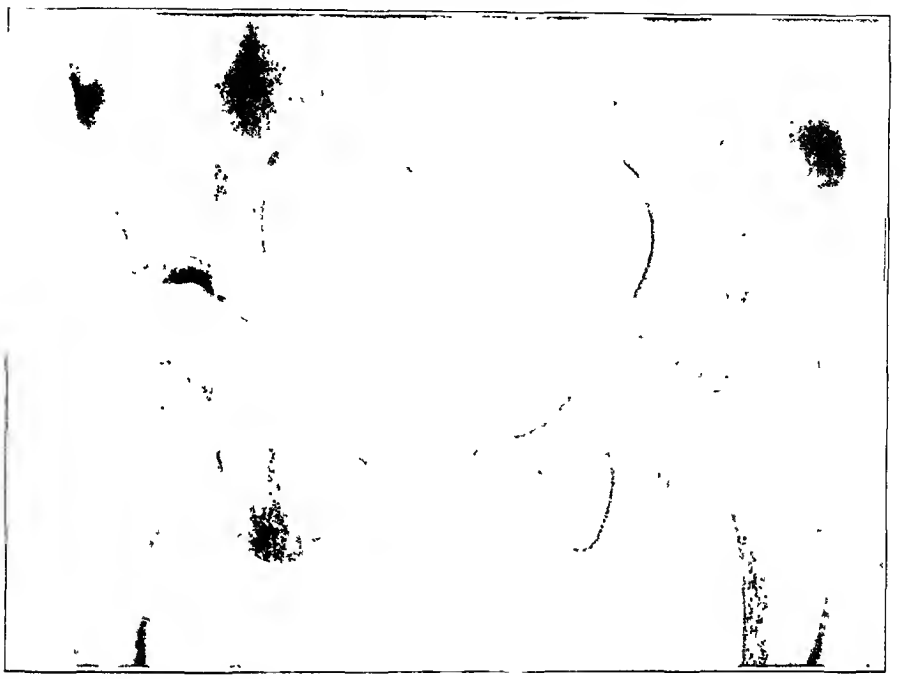

FIG. 12-D

November 9, 1938. Three years and four months after resumption of weight-bearing.

In analyzing these hips from a purely functional standpoint, there are twenty-six with satisfactory results,—a free range of painless motion, no Trendelenburg sign, and no limp. In the other two hips there is some residual limitation of motion, but in neither is the limitation of sufficient degree to cause a limp, nor is there a Trendelenburg sign or shortening. Both cases show flexion to 90 degrees, abduction to from 40 to 60 degrees, and about half the normal amount of internal and external rotation. It is most interesting to note that both of these cases with some restriction of hip motion fall into the open-reduction and acetabular-reconstruction group.

CONCLUSIONS

1. Skeletal traction as a preliminary procedure to open or closed reduction and to the various types of shelving operations in older children has been practised for a number of years, and its use has proved of great value.

2. With the use of wire instead of a Steinmann pin or calipers, this form of treatment is readily applicable to children under the age of seven years.

3. The wire-traction apparatus described is simple to use, is effective in its application, and is ideally suited to the younger age group.

4. Preliminary skeletal traction greatly increases the percentage of cases in which atraumatic closed reductions can be expected.

5. In open reductions, preliminary skeletal traction reduces the time

of operation, eliminates the radical cutting of resistant soft parts, and avoids the use of force at the time of actual placement of the head into the acetabulum.

6. In both open and closed reductions, skeletal traction prevents post-reductive intra-articular jamming, and in the acetabular reconstructions with shelving, upward displacement does not occur.

7. This method favors the rapid return of post-reductive active and passive motion.

8. In young children skeletal wire traction should be applied only to the lower end of the femur.

9. To be adequately effective, the head of the femur must be pulled down below the level of the center of the acetabulum and held in this position for a week or ten days before either closed or open reduction is attempted.

10. In the series of hips reported the percentage of entirely satisfactory results is much higher than has been obtained in this Clinic prior to the use of skeletal traction.

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DIRECT LEVERAGE IN THE TREATMENT OF GUNSHOT FRACTURES OF THE FOREARM

BY FRANCISCO P. DUEÑO, M.D., MADRID, SPAIN

The purpose of this paper is to present the technique used by the author to reduce some types of gunshot fractures of the lower two-thirds of the radius in which he employs a new method of direct leverage that has proved to be particularly adapted to the reduction and retention of the obliquely displaced fractures of that bone.

Traction alone enables the reduction of most fractures of both bones of the forearm, and, in fractures of the lower two-thirds of the radius, it is usually possible to obtain good alignment. There are, however, some cases in which even a strong traction force does not succeed in separating the lower fragment of the radius from the fractured or non-fractured ulnar diaphysis. Fractures of the middle and lower thirds of the radius seem to be the most difficult to deal with, because of the ulnar deflection of the upper end of the fragment, with consequent radial deflection of the hand and wrist.

To explain the mechanism of this deflection, we must consider the forces involved in the etiology, as well as the anatomy and the physiology. For that reason, emphasis is placed on the importance of the interosseous membrane of the forearm and also of the different muscle actions, particularly that of the pronator quadratus. The shrinkage of the interosseous membrane causes permanent displacement of the bone fragment, and the stretching action of the pronator quadratus, when the arm goes into supination, pulls the distal radial fragment ulnaward and increases the over-riding as well as the displacement. Other muscles, such as the abductor pollicis longus and the extensor pollicis brevis, help to increase the amount of displacement by pressing the distal radial fragment against the ulnar diaphysis.

As far as the author has been able to determine, the first attempt to counteract the ill effects of the muscle action was made by Borchgrevink, of Norway. He employed a special splint to apply traction, using adhesive strips, and when, after four or five days, reduction was not effective, by means of a strong curved needle he introduced a wire or a silk thread and encircled the upper end of the displaced radial fragment. The ends of the loop should pierce the skin one and five-tenths centimeters apart, in order to prevent pain when lateral traction is exerted with a flat tube.

Böhler and his followers place wooden pieces of cylindrical shape with pointed ends along the volar and dorsal surfaces. When the plaster cast is applied, these pieces are pressed together, causing the fragments to be reduced. More recently, Thomson has described a method of direct leverage, using an ordinary dental chisel or straight dental instrument with a blunt point, which he introduces between the overriding fragments under the fluoroscope.

Jewett advocates the use of two screws inserted in the lateral surface of the dislocated bone. The desired extension is secured by separating the two Kirschner wires placed through the olecranon and the lower radial and ulnar fragments. Then, by the exertion of strong outward traction on the screws, the fragments are brought into normal alignment.

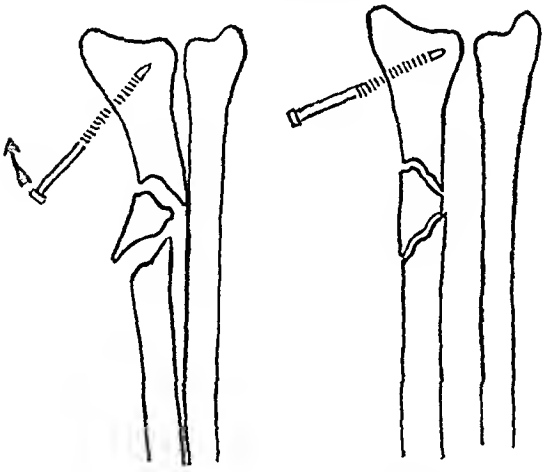

FIG. 1-A FIG. 1-B

Diagrammatic drawing showing:
Fig. 1-A: The condition of the bones on insertion of the screw.
Fig. 1-B: How pushing on the screw results in perfect reduction of the fragments.

To obtain reduction, the author uses the lever action of a long screw, which he introduces into the lower metaphysis and epiphysis of the fractured radius at an angle of 45 degrees. This screw is nine centimeters long and four millimeters thick, non-rusting, and of the type once employed for the fixation of femoral-neck fractures. With the patient under a general or a local anaesthetic, the writer, by means of a device

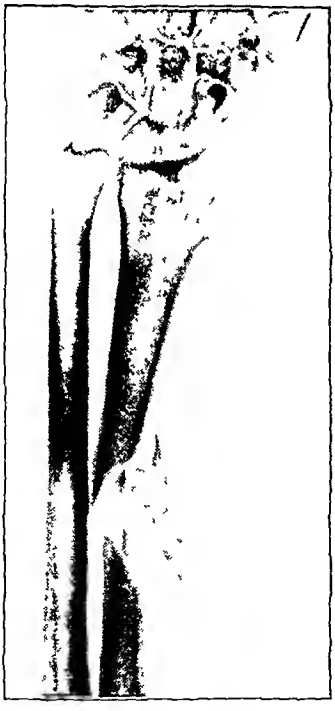

FIG. 2-A

Condition of bones on admission.

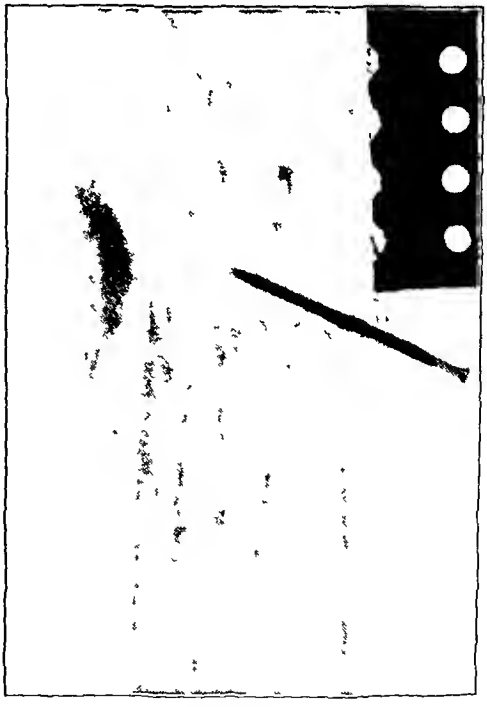

FIG. 2-B

After insertion of the screw, reduction of the displacement, and application of the cast.

similar to the one used by Sokolowsky (described by Zeno), exerts appropriate traction to reduce the longitudinal dislocation. When reduction has been obtained, he introduces the screw through the lateral border of the radius, one and one-half inches over the styloid process, toward the middle of the wrist. As soon as the screw holds firmly in the cancellous tissue of the epiphysis, he pushes the head of the screw and traces an arc, which represents the outward deflection of the displaced end of the radius. (See Figure 1.) The screw is maintained in its new position, and a nonpadded plaster-of-Paris cast is applied from the bases of the fingers to the mid-arm, incorporating the screw. The arm is held with the elbow flexed and the hand midway between supination and pronation. As soon as the plaster is dry and the check-up roentgenograms demonstrate good position of the fragments, active and passive finger and shoulder motions are instituted. The screw remains inserted until roentgenograms show that bony union has taken place.

As regards the treatment of the external wounds, those seen within twelve hours after injury are thoroughly cleansed and débrided, and only the severed tendons or nerve trunks are sutured. Pieces of bone from the fracture bed are not removed unless they are scattered among the soft parts or cannot be cleansed. Neither catgut sutures nor any foreign bodies are left within the tissues. When the wound is perfectly clean and dry, the skin borders are sutured with silk and the fracture is reduced as described.

In the cases seen at longer intervals after injury, when a low-grade infection is present, a cod-liver-oil vaselin-gauze bandage is applied to the wound, after which the fracture is reduced by the method outlined.

CASE REPORT

M. R., twenty-seven years of age, a soldier, was wounded by a rifle bullet. On admission to the hospital a few hours after the accident, under brachial block, two soft-part wounds in the middle third of the left forearm were resected and sutured. The condition of the bones is shown in Figure 2-A. A lateral roentgenogram demonstrated an insignificant displacement. Traction was exerted and then a screw was inserted until it held firmly. Next, pressure on its head caused the screw to follow the axis of the bone, as has been explained, and

FIG. 3-A

Normal aspect of the forearm and hand eight weeks after admission.

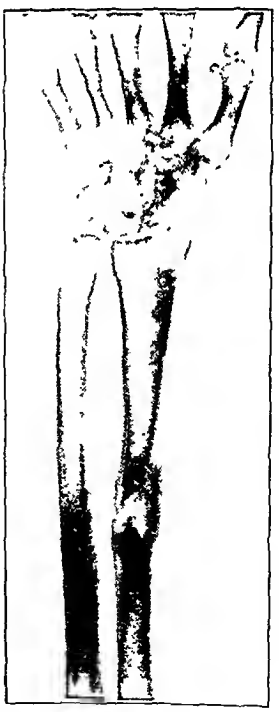

FIG. 3-B

End result, showing perfect reduction and strong bony union.

immediately a non-padded plaster-of-Paris cast was applied from the bases of the fingers to the mid-arm; the screw was firmly fixed with plaster. As soon as the plaster was dry and the effects of the brachial block had disappeared, the patient was encouraged to move the fingers and shoulder. Figure 2-B shows the condition following reduction. After six weeks, the screw was removed, and a new cast was applied. This cast was removed two weeks later. At that time there was total recovery of function in the forearm, hand, and fingers (Fig. 3-A), as well as excellent alignment and strong bony union of the fragments (Fig. 3-B).

SUMMARY

The satisfactory results which have been obtained by the author by using the lever action of a long screw for the reduction of obliquely displaced fractures of the radius would seem to indicate that this procedure should be tried in many cases usually subjected to operative treatment.

The author has employed this method in gunshot fractures, but it seems equally or even more adapted to civil surgery.

In all cases treated by the author the screw has been perfectly tolerated, and even in cases of infection its early removal because of focal osteitis has never been necessary.

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OPERATIVE RECONSTRUCTION OF THE PARALYZED UPPER EXTREMITY *

BY LEO MAYER, M.D., NEW YORK, N. Y.

Three operations are of particular value in the reconstruction surgery of the paralyzed upper extremity. These are: (1) the Bunnell operation for paralysis of the small muscles of the thumb; (2) the Steindler tendon shift at the elbow; (3) arthrodesis of the shoulder. The purpose of the present paper is to present a few observations of practical importance connected with these operations and to report the author's experiences with a fourth operation,—the transplantation of the trapezius, which may at times be used instead of the shoulder arthrodesis.

THE BUNNELL OPERATION

This operation has been so clearly presented by Dr. Bunnell in the April 1938 issue of *The Journal of Bone and Joint Surgery* that it needs no further clarification. The writer began doing the operation more then ten years ago and, although in many cases the results were excellent, he found to his great disappointment that in most of the poliomyelitic patients the results were disappointing. The patients were able to adduct the thumb (Fig. 1), the transplanted tendon could be felt acting with considerable force, but a satisfactory opposition motion did not occur. Despite all attempts to improve the technique and the after-treatment, the poor results continued to multiply and until two years ago the author could find no explanation. Cadaver studies showed that, following the execution of the Bunnell operation, traction on the transplanted tendon would produce an almost perfect opposing motion of the thumb. Why did this not occur in patients? Some of the writer's associates suggested some type of bone-blocking procedure which would prevent adduction but would permit opposition. When tried on the cadaver, this did not result successfully.

FIG. 1

The result of an unsuccessful Bunnell operation. There is powerful adduction, but no opposition.

* Read at the Annual Meeting of the American Academy of Orthopaedic Surgeons, Memphis, Tennessee, January 17, 1939.

Others suggested a combination of the Bunnell operation with a tenodesis of the extensor tendons, so as to hold the first metacarpal in an extended position. This was equally unsuccessful. Finally, it occurred to the author that possibly, because of the long continuance of the deformity in paralyzed children, a contracture might have developed. With this in mind he performed a simple experiment on the cadaver to reproduce a contracture similar to that found in a flat hand. This was done by introducing a silk suture into the posterior capsule of the carpometacarpal joint of the thumb. After this suture had been introduced, the Bunnell operation on the cadaver failed. The thumb could not move into the position of opposition, because the normal rotation motion of the metacarpal bone was hindered. This fact seems so elementary and obvious that the writer hesitates to publish it; yet its practical application has resulted in such marked improvement in our operative results (Fig. 2) that others may possibly benefit from our experience. Every patient with paralysis of the opposing muscles of the thumb is now subjected to a rigid examination for a possible contracture either at the carpometacarpal joint or the intercarpal joint. The examiner must be careful not to be deceived by a pseudo motion. These weakened paralyzed hands are so relaxed that, unless great care is taken, the surgeon will not note the existence of the contracture. However, in our experience it is almost invariably present in patients who have been paralyzed for two or more years. Once the contracture has been recognized, it is evident that it must be corrected, just as every contracture must be corrected before a tendon transplantation is done. It is now our routine before beginning the Bunnell operation to make a small dorsal incision over the carpometacarpal joint of the thumb and to divide completely the tightened capsular structures. The thumb must swing passively into a position of perfect opposition before the tendon transplantation is done.

FIG. 2

The result of a successful Bunnell operation for complete paralysis of the opposing muscles of the thumb. The operation in this case was preceded by the division of the dorsal capsule of the carpometacarpal joint.

THE STEINDLER OPERATION

This operation has given an unusually high percentage of good results. Frequently it has been followed by a mild flexion contracture of the arm amounting to about 25 degrees. This has always seemed to the author to be a small price to pay for the marked improvement in the

power of flexion. Although the operation was originally applied only to the group of muscles springing from the medial epicondyle, it is also indicated when the group springing from the lateral condyle of the humerus has sufficient power for transplantation purposes. Either group alone or both together may be used The technique of the operation is by no means easy; it involves a thorough dissection first of the ulnar nerve and then of the median nerve. Unless this is done, the muscles cannot be freed sufficiently for adequate displacement upward without danger of severing their nerve supply. The incision must be so made as to give free access to the two nerves and at the same time to expose both the muscles of the forearm and the site of the new implantation. The author finds that these conditions are best met by a curving incision, beginning three and one-half inches above the elbow over the anterior aspect of the humerus, running in a gentle curve back of the medial epicondyle, then swinging forward onto the anterior surface of the forearm, and ending about five inches below the elbow. With the patient's arm brought over his chest, so as to expose the posterior aspect of the elbow, the ulnar nerve is first dissected out and freed until the muscular branches entering the upper portion of the flexor carpi ulnaris have been exposed. The skin flap is then dissected forward to expose the median nerve, the muscular branches of which are next dissected out. It is then possible without danger to either nerve to cut away the muscles from the medial epicondyle, together with a small piece of bone or cartilage, and to strip them downward for a distance of four or five inches. In reattaching the muscles to the upper arm the author has found it wiser to implant them directly into the humerus rather than into the intermuscular septum: first, because a bony implantation is more secure than a fascial implantation; second, because the more nearly vertical the line of muscle action, the greater the flexor power; third, because the bony implantation to the midline lessens the danger of pronation contracture, which sometimes occurs after attaching the muscles to the medial intermuscular septum. The bony implantation is as follows: A drill hole is made in the humerus one-half an inch above the point at which the muscles are to be attached. Then a trap door of bone is lifted away from the anterior surface of the humerus, exposing the medullary cavity. By means of Rechtman's flexible needle, a guide suture is passed from the trap door out through the drill opening. The muscles, threaded with a strong chromic fixation stitch, are drawn underneath the trap door by means of this guide suture, which is then pulled out through the drill opening. Before the muscles are sutured in place, the skin wound of the forearm is closed. If this is not done, the operator will always find it hard to suture at the bend of the elbow with the arm in the acutely flexed position necessitated by the transplantation. After the forearm wound has been sutured, one strand of the muscle-fixation suture is passed through the medial intermuscular septum and the other through the lateral intermuscular septum. As the strands are drawn taut and knotted, the muscle is pulled well with-

in the medullary cavity, where firm fixation within three weeks is almost certain to occur.

If the lateral muscles are transplanted, a corresponding incision is made over the lateral aspect of the arm. Great care must be taken not to sever the branches from the radial nerve. In some instances both the medial and lateral muscle groups have been transplanted when neither one possessed sufficient power to warrant transplantation by itself.

ARTHRODESIS OF THE SHOULDER

This operation has broad indications and is of great value whenever there is a paralysis of the abductor mechanism. It is obvious that it cannot restore the normal range of motion to the shoulder, and in some instances the limitation of shoulder motion which it imposes has caused the patients much inconvenience. This is particularly true in cases of bilateral shoulder involvement where execution of the operation on both sides has made it impossible for the patient to reach the lower part of the back or to get the hand into the pocket. For this reason the writer no longer advises the bilateral arthrodesis.

TRANSPLANTATION OF THE TRAPEZIUS

Ten years ago the author published a substitute procedure,—namely, the transplantation of the trapezius. The principle of this operation consists in the transformation of a shrugging muscle into an abducting muscle by lengthening the trapezius with a graft of fascia lata. As the operation was originally performed, this graft was rolled on itself to form a strong tendon-like structure, which was brought down through a slot cut in the acromion and fastened to the insertion of the deltoid. This operation gave a number of encouraging results, but further experience showed that it could be considerably improved. Experiments on the cadaver indicated that the triangular shape of the deltoid was of a tremendous mechanical advantage in abducting the arm. The following test, which is easily performed, will convince anyone who has any doubt about this fact: Attach a single cord to the insertion of the deltoid, run it underneath the skin to the acromion, and pull on it in the direction of the trapezius fibers. It will be found that a considerable force (twenty-five pounds or more) has to be used to abduct the arm. Next, substitute for the single cord two cords,—one running along the anterior border of the deltoid and the other along the posterior border. Pull on these two cords synchronously, and the arm will abduct with approximately one-half the force used previously. Actual tests with the spring balance show these figures to be accurate. For this reason it seemed to the author advisable to keep the fascial transplant a flat sheet corresponding in shape to the deltoid rather than to allow it to roll so as to form a single cord-like structure. Also this enabled the writer to bring the fascia superficial to the acromion without danger of slipping, such as tended to occur when a cord-like, rolled fascial strip was used. This change in technique has resulted in a marked im-

provement in the operative results as well as a considerable change in the operative technique. The steps of the operation as now done are as follows: A curving incision is made running along the insertion of the trapezius,—namely, the spine of the scapula, the acromion, and the outer third of the clavicle. The trapezius is cut away from the bone and freed upward in the intermuscular plane, separating it from the supraspinatus. Usually the dissection is carried upward for a distance of three or four inches until the large blood vessels and the nerve can be seen entering the deep surface of the trapezius. A second incision is made vertically down the arm from the acromion to the deltoid insertion. The implantation site is then prepared by splitting the deltoid tendon longitudinally for one inch and removing a small window of bone from the humerus at the insertion of the deltoid. Through a thigh incision, a strip of fascia lata of adequate size is removed. This strip must measure three and one-half or four inches wide at the upper end and taper to a point at the lower end. It must reach from the liberated portion of the trapezius down to the insertion of the deltoid. It is placed with its rough side toward the trapezius and its smooth side toward the acromion. Numerous interrupted stitches are taken, fastening the fascia to the fibers of the trapezius on their deep surface as far up the neck as possible. Additional stitches are taken, fastening the tongue-like distal portion of the trapezius to the fascia, which is kept flat like a sheet so as to make it correspond in shape to the deltoid. A second triangle of fascia, measuring approximately about three inches in width and three inches in length, is fastened over the anterior surface of the trapezius and to the lateral margin of the first strip of fascia. The arm is then abducted to 120 degrees. Stitches are taken in the anterior and posterior portions of the deltoid, fastening them to the fascial flap and thus helping to maintain the desired shape of the fascia. The pointed lower end of the fascia is threaded with a strong chromic stitch, just as though it were a tendon, and is drawn into the trap door at the insertion of the deltoid in exactly the same way as in transplanting the peroneus longus to replace a paralyzed tibialis anterior.

The indications for this operation are much narrower than for the arthrodesis. It should be done only when, in addition to a strong trapezius, there are present a strong pectoralis major, serratus anterior, rhomboidei, and levator scapulae. It should never be done when there is a subluxation of the humerus. Some operators disagree with the author on this point and try to hold the humerus in position by means of a Nicola operation, which precedes the transplantation of the trapezius. The writer's own experiences with this double procedure, however, have not been favorable. Next, it must be remembered that the transplantation is far more difficult technically than the arthrodesis. It requires much practice and a carefully trained team of workers. The third objection to the operation is even more far reaching; it necessitates an unusually long period of postoperative treatment. Patients must be willing to keep the arm in an abduction splint for a minimum of six months, and frequently

a year or more may be neeessary. Even after this time the patient must be assiduous in keeping up the prescribed exercises, since otherwise much of the power of the transplanted trapezius will be lost. If, however, the conditions laid down are met, the operation gives an almost normal range of motion at the shoulder (Figs. 3-A and 3-B).

In summarizing the results of twenty-five trapezius transplantations the author has divided them into three groups: the good results, with motion ranging from 120 to 180 degrees; the fair results, with motion ranging from 75 to 120 degrees; the failures, with little or no active abduction. There were thirteen good results, five fair results, and seven failures. In the last group an arthrodesis was subsequently performed in each case, and the end results were as successful as though the arthrodesis had been performed as the initial operation. These figures correspond with the results obtained by Dr. S. L. Haas of the San Francisco Unit of the Shriners' Hospitals for Crippled Children. He states that in thirty-five cases he had six very good results, with motion ranging from 110 to 180 degrees; seven good results, with motion from 80 to 110 de-

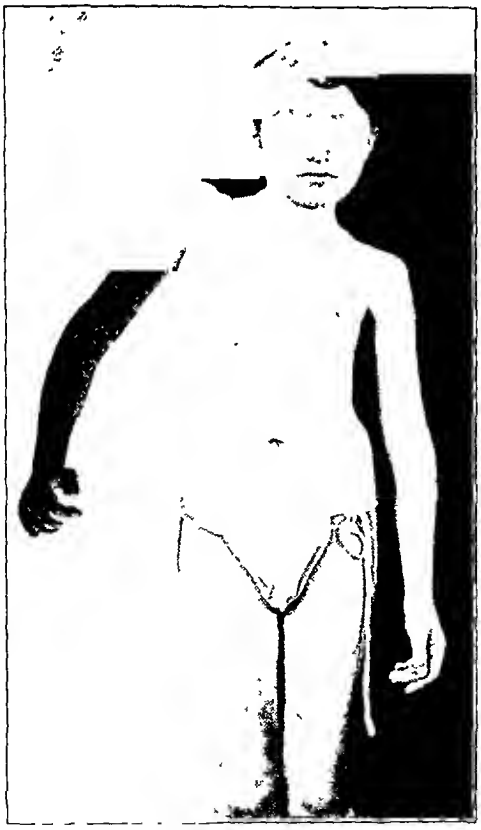

FIG. 3-A

FIG. 3-B

These photographs illustrate the range of motion in the right shoulder before and after transplantation of the trapezius muscle for paralysis of the deltoid.

grees; nine fairly good results, with motion ranging from 60 to 80 degrees; six fair results, with motion ranging below 60 degrees; and seven failures.

It is particularly important to analyze the group of failures. Several factors were responsible:

1. The indications were not followed rigorously. The operation was sometimes done when there was insufficient strength in the pectoralis major and the other accessory muscles.

2. There was an error in the operative technique. This is particularly true of the earlier cases in the series in which the fascia lata was allowed to roll on itself, so as to form a cord-like structure.

3. There was an accident in the after-treatment. Many of the patients gave a similar history: at first there was a fair range of abduction, frequently as high as 135 degrees, and then the patient fell or struck the arm or traumatized it in some way. A snap was usually felt and, following that, abduction ceased. Presumably the fascial strip tore away from its attachment. In reoperating on these patients, so as to arthrodese the shoulder, the transplanted fascia was usually found adherent to the surrounding tissues, making it impossible for the trapezius to exert any lifting action on the arm.

Despite the failures, the difficulties of the operative technique, and the long after-treatment, the operation has, in the author's opinion, a definite place in a limited group of cases. However, it should never be done unless the surgeon is willing to practise the operation on the cadaver, and the patient is willing to carry out the lengthy, arduous after-treatment.

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FRACTURES OF THE PELVIS

Management by Use of a Posterior Plaster-of-Paris Shell

By G. J. Curry, M.D., F.A.C.S., Flint, Michigan

The diversity of methods of treatment of fractures of the pelvis suggests that a satisfactory basic scheme has yet to be found. While many of these methods may be used successfully in certain types of cases, the author wishes to present a plan of treatment which he has employed in a considerable number of cases, with excellent results.

TABLE I

Distribution of Fractures

Site of Fracture	No. of Cases	Per Cent
Pubis (alone)	56	61
Ilium (alone)	7	8
Pubis and ischium	6	7
Pubis and ilium	6	7
Pubis and acetabulum	5	5
Ischium (alone)	5	5
Pubis and sacrum	2	2
Acetabulum (alone)	2	2
Pubis and lumbar vertebrae	1	1
Pubis, ilium, and ischium	2	2
Total	92	100

TABLE II

Associated Injuries

Type of Injury	No. of Cases	Per Cent.
Rupture of bladder	5 *	5
Rupture of urethra	2 †	2
Complications of ruptured bladder or urethra	7	8
Miscellaneous other fractures	20	22
Miscellaneous dislocations, but no other fractures	5	5

* Recovery took place in 3

† Recovery took place in 1.

Over a period of ten years, ninety-two patients with pelvic fractures have been treated on the Traumatic Service at Hurley Hospital. Table I gives the distribution of the fractures, and Table II lists the associated injuries. During the first four years of this decade, bed rest with one or

more of the commonly employed forms of apparatus was used. For the past six years, posterior plaster-of-Paris shells have been employed with increasing frequency and satisfaction. Beginning with this basic scheme of management, lower-extremity traction and transverse traction have been used for the special problems of the individual fractures. The only apparent contra-indication to the posterior plaster-of-Paris shell is wide separation of the symphysis pubis. This particular type of fracture seems to respond better to a sling with transverse traction. If these fractures are associated with injuries such as rupture of the bladder or of the urethra, fracture of the spine, cerebral traumatism, thoracic injuries, and fractures of the extremities, there must of necessity be a combination of procedures.

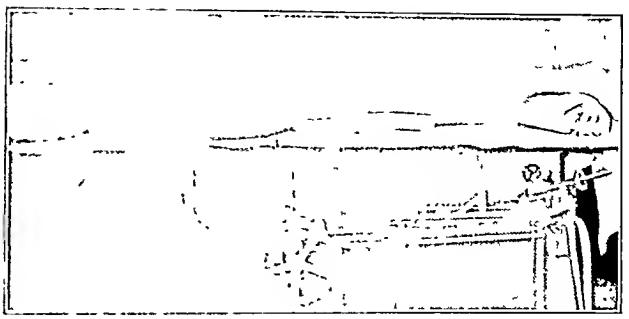


FIG. 1

Position of patient for application of posterior plaster-of-Paris shell. Note lumbar curve.

The method of application of a posterior plaster-of-Paris shell is as follows: The patient is placed face down on a narrow table and held in a hyperextended position by rolls of blankets at the level of the shoulder joints and the upper chest, the thighs, and the ankles. A small pillow is put under the chin, and the arms hang over the side of the table. (See Figure 1.) Adjustments in position are then made: first, to see that the spine is straight; second, to secure abduction of the thighs of 35 to 40 degrees; and third, to obtain a satisfactory lumbar lordosis. The size of the blanket rolls can be changed to effect the latter position. Sheet cotton is then applied by cross rolling to protect the patient's skin, and the plaster-of-Paris is applied in like manner from just below the popliteal space to the lower cervical region. A cross bar is incorporated between the thigh pieces just above the knees. Oblique and longitudinal rolls strengthen the shell and, when the proper thickness is ensured (usually from one-half to three-fourths of an inch), the shell is

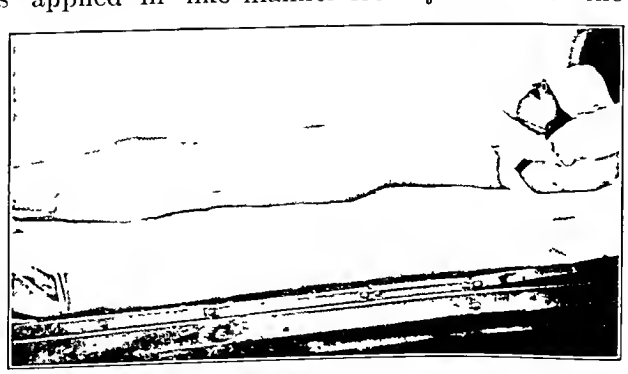


FIG. 2

Posterior plaster-of-Paris shell in place. Note preservation of lumbar curve. The shell hugs the sides of the body and the lower extremities.

marked at the edges to give the proper shape, lifted from the patient, trimmed, and dried by baking. When dry, the shell is repadded and covered with stockinet, and the edges are smoothed and bound. The patient is then placed in the shell on a large Bradford frame, and immobilization is maintained until roentgenograms show adequate union. The shell is then removed, and normal movements of the patient in bed are advised for a few days. Physiotherapy is instituted if necessary. The use of a wheel chair and weight-bearing are then permitted at proper intervals.

The longest period of immobilization was five months in a case of multiple fractures of the rami, rupture of the bladder, and partial sacroiliac dislocation. This patient began walking two weeks following removal of the shell, with no untoward symptoms. The roentgenologist reported satisfactory union at all fracture sites. The shortest period of immobilization was three weeks in a case of fracture of the left superior ramus. This patient walked one week after removal of the shell. The average period of immobilization was about ten weeks. This of course varies with the individual case, depending upon the number of fractures, healing powers, complications, etc.

Several advantages are gained by this scheme of management. Nursing care is minimized. The bone fragments are allowed to sag into place, and lumbar lordosis is preserved. Table I shows that 61 per cent. of the fractures were of the pubis alone. It is the author's belief that not only in pelvic fractures, but in all forms of bed rest where shift of position is not possible, backache and subsequent disability are caused by flattening of the normal lumbar curve. This is perhaps a common observation, but in general it appears to receive little consideration. Many of us have observed our patients resting their backs by placing their hands or hot water bottles in the region of the lumbosacral joint. In the past six years the author has become convinced of the importance of this finding.

RAPID ROENTGENOGRAPHY IN THE OPERATING ROOM, WITH A SINGLE SOLUTION

BY F. R. WILKINSON, M.D., NEW YORK, N. Y.

From the Hospital for the Ruptured and Crippled, New York*

Roentgenographic control of operations upon bones is coming into more general use. Its field of greatest usefulness perhaps is found in operations upon the hip, notably for fracture of the neck of the femur, in which a Smith-Petersen nail is introduced by the so-called "blind method". All the numerous methods of blind nailing depend, to a greater or lesser degree, upon roentgenographic control. Several roentgenograms must be taken during the course of the operation.

Many of the patients are elderly and are poor operative risks. Anything which decreases the time which they spend on the operating table under anaesthesia is of definite value.

At the Hospital for the Ruptured and Crippled we had been using developer heated to 100 degrees Fahrenheit. The film was overexposed, placed in this developer for approximately thirty seconds, washed in water, placed in "hypo" for from one and one-half to two minutes, washed again, and then brought to the operating room. This method had the following disadvantages:

1. Without thermostatic control it was impossible to keep the developer at a constant temperature, and a variation of even a few degrees made a marked difference. If the developer was too cold, the film was underdeveloped; if too hot, the film was overdeveloped or the emulsion melted and ran.

2. It was not possible to develop and fix the films in less than three minutes.

3. Three containers, for developer, water, and "hypo", were required.

4. It was essential to have the dark room close to the operating room unless more valuable time was to be lost. In many hospitals this is impractical.

In a search for a simpler method for the rapid development and fixation of roentgenograms, an article by Mr. Robert G. W. Ollerenshaw [1] was found. He has evolved a single solution with which adequate films are developed and fixed in one minute.

With his formula, under the conditions obtaining at this Hospital, two minutes were required for development and fixation. A number of experiments were carried out in an endeavor to shorten the time and to improve the quality of the roentgenograms. Many modifications of the solution were tried. Better results were obtained when elon was substituted for part of the hydroquinone. Elon is a rapid developing agent;

* Philip D. Wilson, M.D., Surgeon-in-Chief.

hydroquinone, while slow, gives good black and white contrast. Finally eight grams of hydroquinone and eight grams of elon were substituted for the thirty grams of hydroquinone in the original formula, and satisfactory films were produced in forty-five seconds.

Formulae

A: Hydroquinone	8 grams
B: Elon or metol	8 grams
C: Sodium sulphite (anhydrous)	100 grams
(or crystalline, 200 grams)	
Sodium carbonate (anhydrous)	60 grams
(or crystalline, 160 grams)	
Sodium hydroxide (stick)	50 grams
Water to	1,000 cubic centimeters
D: Sodium thiosulphate (crystalline)	375 grams
Water to	1,000 cubic centimeters

INSTRUCTIONS

1. Dissolve *A* in 100 cubic centimeters of hot water. Dissolve *B* in 100 cubic centimeters of hot water. Mix *A* and *B* together. Then add 400 cubic centimeters of *C* and 400 cubic centimeters of *D*. This takes only two or three minutes. The solution should be made up just before use; it deteriorates overnight. One thousand cubic centimeters of solution costs approximately fifty cents.

2. The chemicals used must be analytically pure.

3. *A* and *B* should be kept weighed out and wrapped as powders in airtight tins.

4. *C* and *D* will keep indefinitely in separate bottles. They may be made up in any quantity desired.

5. The normal exposure time for the machine in use should be at least doubled.

6. It is well to take a roentgenogram before the operation is begun to be sure of the optimum penetration and exposure.

7. After the surgeon has seen the films, if they are to be kept as a permanent record, they should be placed in "hypo" for three minutes and then washed well in water. This makes them clearer and less likely to fade.

DISCUSSION

This method has four definite advantages over other methods:

1. It is faster.

2. It is simpler,—only one solution is required.

3. The poor results due to variation in temperature of the hot developer are eliminated, because the solution is used at room temperature. Therefore, the technique is more easily standardized, and comparable films are readily obtained.

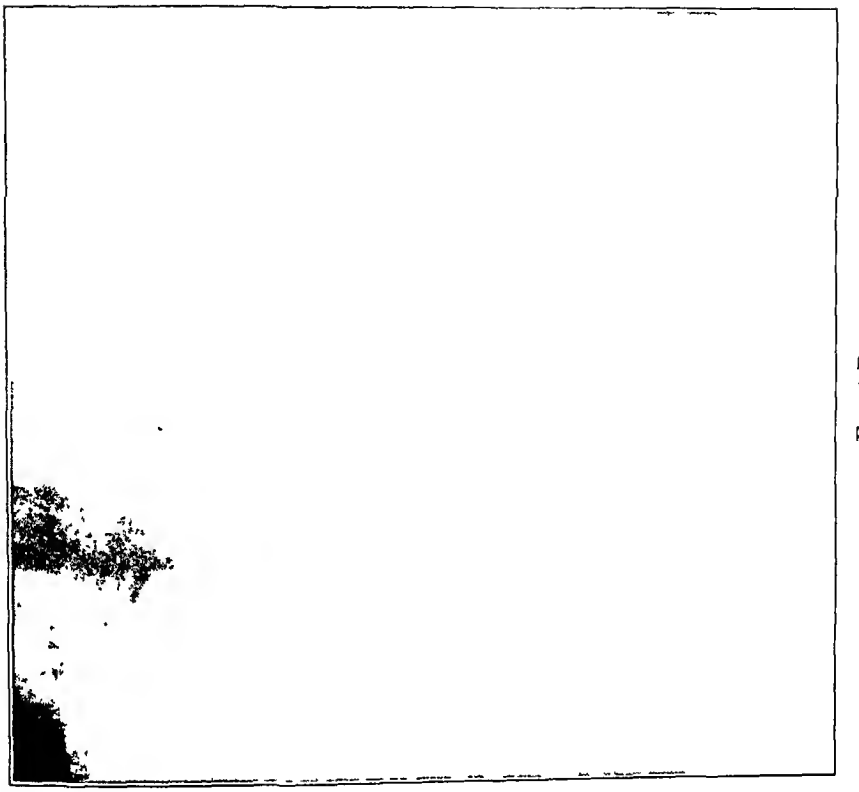


FIG. 1-B

FIG. 1-A

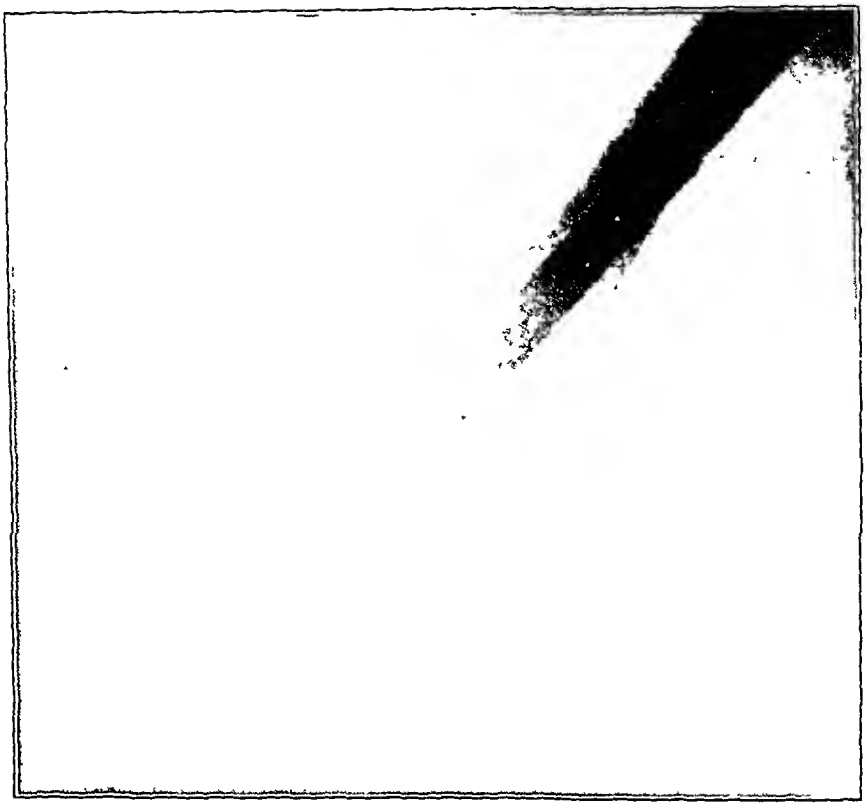


FIG. 2-B

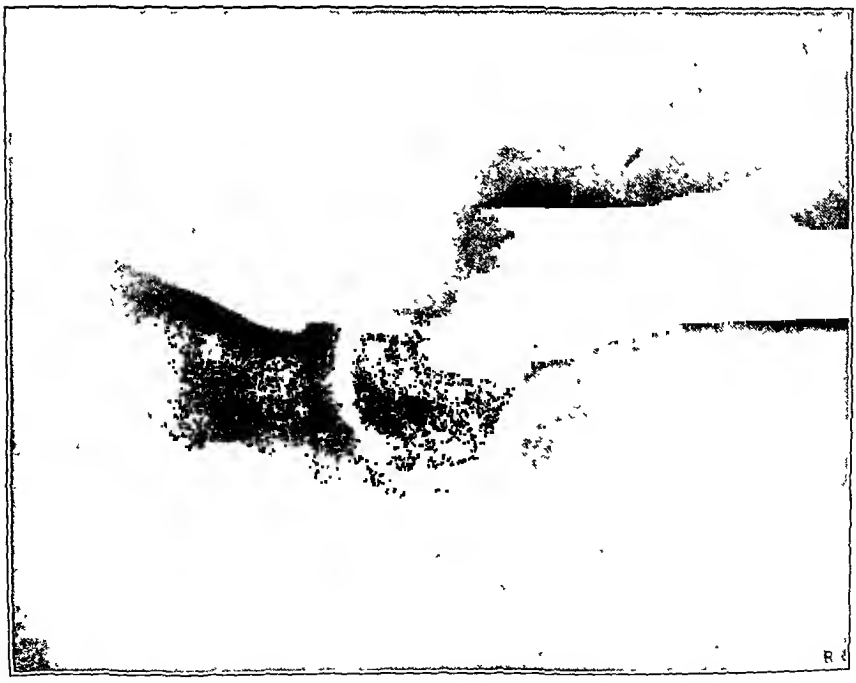


FIG. 2-A

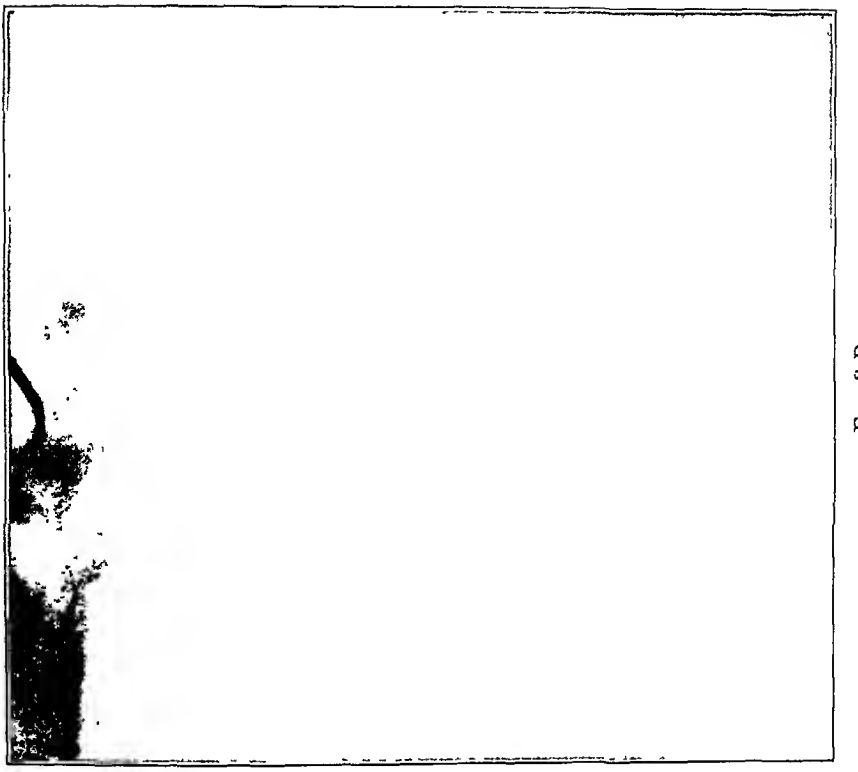


FIG. 3-B

FIG. 3-A

4. There is a wide margin of error; adequate films have been produced with exposure times varying from one-half to one and one-half seconds.

As suggested in Mr. Ollerenshaw's article, it is easy to make a portable developing box for use in hospitals which have no dark room close to the operating room. The fact that only one dish is required, instead of three, is an obvious advantage.

Figures 1-A through 3-B are of a recent case of slipped capital femoral epiphysis operated upon in this Hospital. They were taken with a portable machine without a Bucky diaphragm. Anteroposterior and lateral views were taken in quick succession. The two films were then placed in the solution in a pan, care being taken that they did not stick together. Development and fixation were complete in forty-five seconds. After the surgeon had seen them, they were placed in "hypo" and then washed in water. As may be seen, they are far from perfect roentgenograms from the technical point of view. However, the alignment of the bones and the position of the metal fixation are shown clearly. They give all the information required by the surgeon. Further experiments are being carried out in an attempt to improve the quality of the films.

The author wishes to thank Dr. Raymond W. Lewis, Roentgenologist at the Hospital for the Ruptured and Crippled, and his Staff for helpful advice and criticism; Mr. C. J. Van Allan of the Eastman Kodak Company, Mr. A. Albert of the Albert X-Ray Inc., and Mr. W. G. Duerre of the General Electric Company, for their invaluable technical assistance.

1. Ollerenshaw, R. G. W.: Rapid Radiography for the Smith-Petersen Operation. British Med. J., I, 569, 1938.

THE USE OF CELLOPHANE AS A PERMANENT TENDON SHEATH *

BY THOMAS WHEELDON, M.D., RICHMOND, VIRGINIA

The writer has been using cellophane for the lining of joints in arthroplastics for over three years. In a series of nearly fifty cases the following joints have been operated upon: hips, knees, shoulders, elbows, wrists, and fingers. In this series of cases there has been no irritation of the tissues by the cellophane in any way.

So far as the writer knows there is no published work upon the use of cellophane as a permanent substitute for tissues, and he has had no precedent to lean upon. He has used No. 300 moistureproof transparent film. It is .00088 of an inch thick, and has a yield of 21,500 square inches per pound. Cellophane comes in various thicknesses, and the kind used was selected after the various types had been investigated. Cellophane can be boiled for twenty minutes, with no apparent change other than to become tougher. The excellent function of the joints, with no evidence of irritation either immediately after the operation or at any subsequent time, leads the writer to believe that cellophane remains unabsorbed indefinitely.

An arthroplasty was performed upon an ankylosed hip which had had a pyogenic infection fifteen years previously. This appeared perfectly healed, and six weeks of massage previous to the operation did not stimulate any irritation. Following the operation the patient developed multiple abscesses, and inquiry revealed the fact that the patient had withheld from the writer the information that he had had such abscesses from time to time from the onset of his trouble. In spite of these abscesses, which the writer believed to be semisuperficial, the convalescence from the arthroplasty was not altered. There was no evidence that the cellophane was affected by this irritation, and the result of the arthroplasty was far above the average result experienced in arthroplasties of the hip joint. The abscesses healed in a few weeks, and have not recurred over a period of two years.

The writer operated upon a knee ankylosed from a Neisserian infection, and ten days after the operation an interne inadvertently cut the patient's thigh in cutting the plaster. The thigh became infected, but in spite of this the cellophane does not seem to be affected, as the writer has inspected the material through drainage incisions and has taken out several small pieces of the cellophane for examination. The infection is clearing up completely, and there does not seem to be evidence that the cellophane is acting as a major foreign body.

Cellophane has been used by the writer as a non-absorbable suture

* Read at the Staff Meeting of the Petersburg Hospital, Petersburg, Virginia, January 12, 1939.

material, and no irritation has been found in cases where a good-sized rope has been used in the suture of acromioclavicular separations.

Since starting this work, the writer has been supported in his belief that cellophane is non-irritating by personal communication with Dr. A. W. Farmer, of Toronto, who appears to have drawn the same conclusions from unpublished experimental work on animals. As the writer has never had any excuse (although he probably would have used the slightest one) to remove the cellophane used in any of these operations, he cannot speak with certainty as to how much, if any, of the cellophane is absorbed in the human. With this experience behind him, the writer

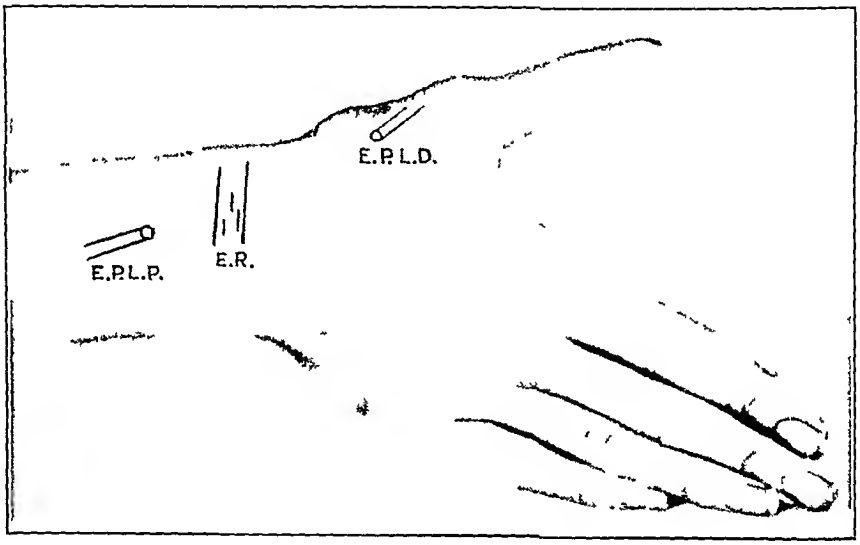


FIG 1

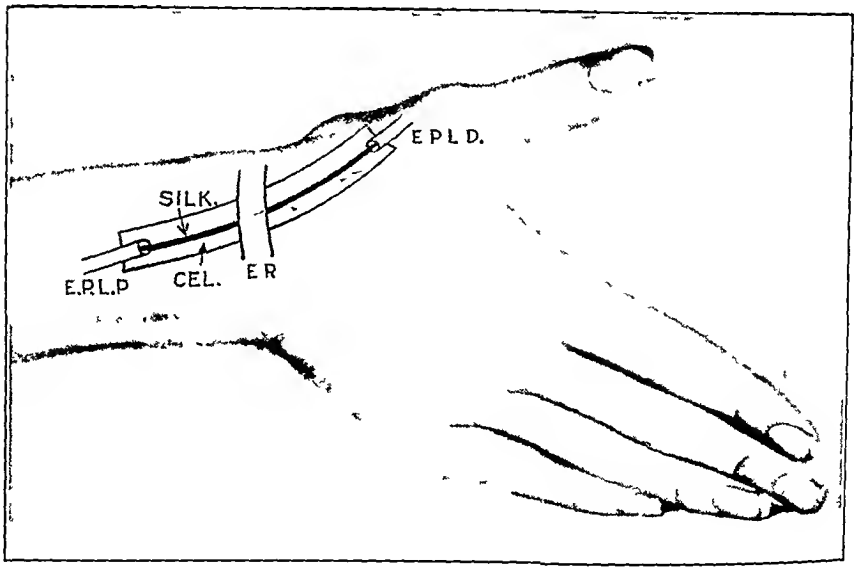


FIG 2

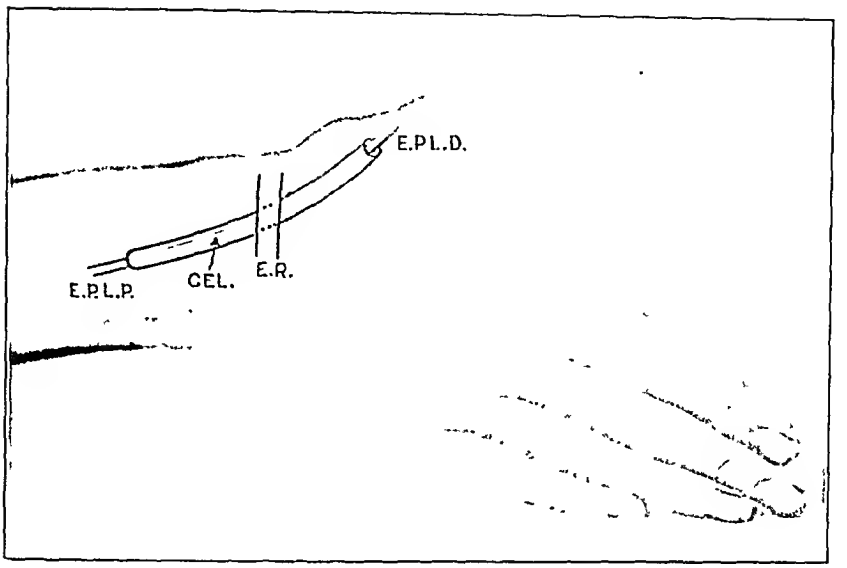


FIG 3

elected to use cellophane as a permanent tendon sheath in the following case.

The patient was a boy, eighteen years of age, in whom the tendon of the extensor pollicis longus had been cut with a piece of glass four weeks before he was seen by the writer. When the patient was brought to the writer, the skin incision had healed with no irritation, but there was present the deformity to be expected from such a condition. At operation, the dorsum of the hand, wrist, and forearm was carefully dissected, and the distal end of the proximal fragment of the extensor pollicis longus (*E.P.L.P.*) and the proximal end of the distal fragment of the extensor pollicis longus (*E.P.L.D.*) were identified. It was difficult to explain, but the two fragments were almost five inches apart,

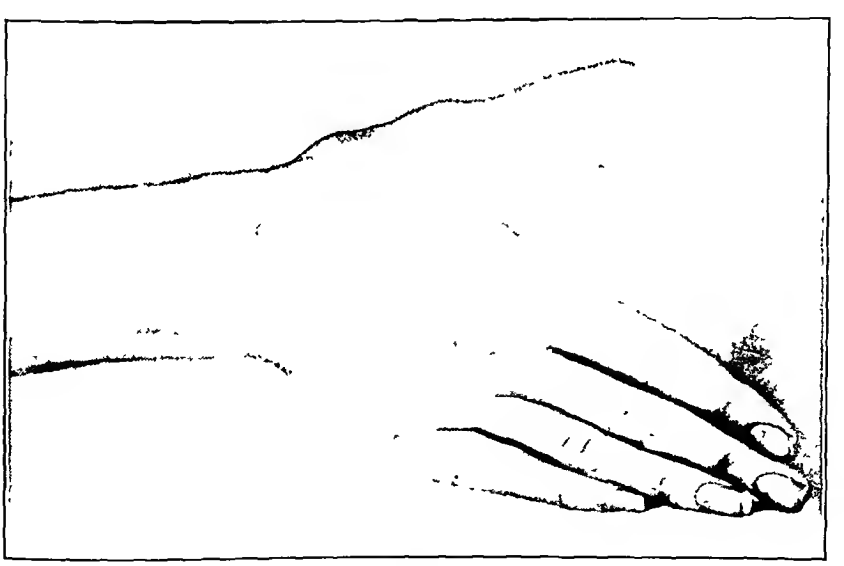


FIG. 4

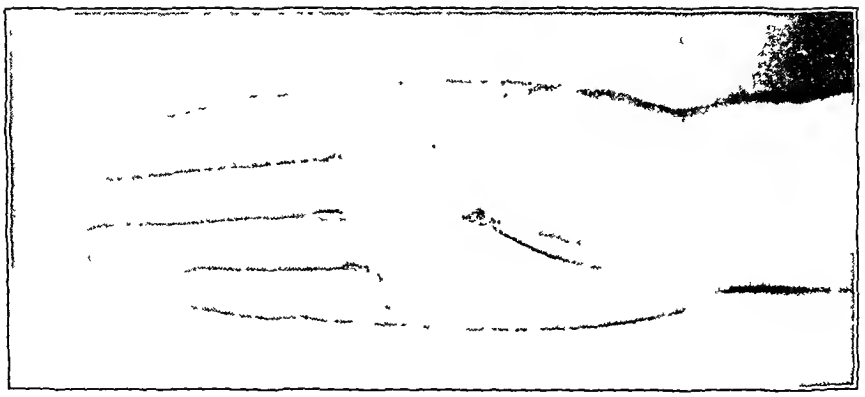


FIG. 5

as shown in Figure 1. The ends of the two fragments were freshened, and the two ends were united with four strands of heavy, black, braided silk strongly plicated into the distal end of the proximal fragment and the proximal end of the distal fragment, this strand being carried beneath the extensor retinaculum (*E.R.*), or ligamentum carpi dorsale. The sheath of cellophane (*CEL.*) was then drawn underneath the distal end of the proximal fragment, under the silk, and under the proximal end of the distal fragment, the cellophane being of such a length as to extend about one-half an inch proximal to the distal end of the proximal fragment and about one-half an inch distal to the proximal end of the distal fragment. (See Figure 2.) The cellophane was next wrapped around the two fragments of tendon, enclosing the black silk and making a cylindrical tube. (See Figure 3.) This was sutured with No. 00 plain catgut. After closure of the incision, the extremity was placed in plaster, with the thumb in a physiological position, and held in this position for three weeks. The plaster was then removed and a cock-up splint was applied on the palmar surface for three weeks longer. All support was then removed and gentle physiotherapy, in the form of massage and active and passive exercises, was started.

At present, the patient has excellent ability to extend the thumb (Fig. 4), and at the same time has so little contraction of the extensor pollicis longus that he can almost fully flex his thumb normally (Fig. 5). The thumb is strong and enables the patient to do almost everything that a boy wants to do, in spite of the fact that he is asked to guard against such activities. The wound healed by first intention; there has never been any drainage whatever from the incision, and, at the present time, there is not the slightest amount of scar tissue about the tendon. There are no adhesions and no adherence of the skin.

It would seem, therefore, that it is safe to use cellophane as a permanent tendon sheath.

POSTERIOR FASCIOTOMY IN THE TREATMENT OF BACK PAIN *

BY CLARENCE H. HEYMAN, M.D., CLEVELAND, OHIO

The object of this paper is to record further observations and impressions on the cause and relief of certain forms of back pain. A preliminary contribution on this subject was published in *The Journal of Bone and Joint Surgery* in October 1934. In that communication there were case reports of two patients whose symptoms had been relieved by a stripping or fasciotomy of the structures attached to the posterior third of the crest of the ilium and the posterior superior spine. This has stimulated sufficient interest to prompt one to pass later and more mature judgment upon posterior fasciotomy based on observations and knowledge gained by further experience.

No effort will be made to review the innumerable causes of back pain. The essential point is to recognize that the focus of irritation in many instances is superficial in the ligamentous, fascial, muscular, or periosteal structures, and that these are to be differentiated from a bony, articular, or radicular focus. It should be unnecessary to say that thorough physical, neurological and roentgenographic examinations are necessary in every case of back pain.

It is gratifying, of course, to know of favorable experiences of other surgeons with posterior fasciotomy, but these have not been included in this study. Superficially they would make this report more impressive, but would add nothing, since there would be no consistency in the selection of patients and in the interpretation of results. Since a claim is made that the operation is often applicable, it would appear that the number reported in this paper would be larger. The fact that this number is not large, considering the prevalence of back pain, is pertinent; it indicates that patients for operation have been selected cautiously. Time-honored orthopaedic methods and principles have not been discarded to favor an easy short cut. It is possible that as experience progresses the operation may be done even less frequently.

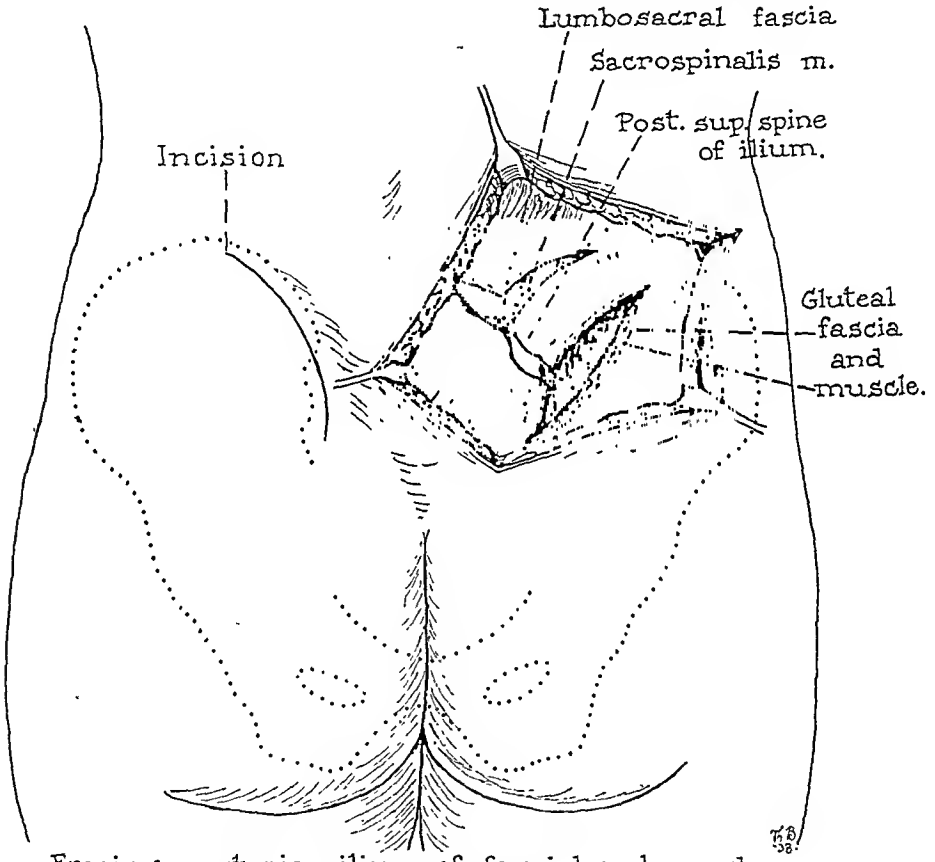
In the early selection of cases, the operation was done only after failure to relieve symptoms by other methods, such as physical therapy, postural exercises, bed rest with traction, braces, casts, novocain injection, and even manipulation under anaesthesia, in order to be more certain that the operation alone was the means of affording relief. This would eliminate the error of ascribing a favorable result to the operation when the benefit may have been due to the psychological effect of impressive treatment. This preliminary treatment, however, while necessary to convince one of the value of a new method, is impractical in the majority of

* Read at the Annual Meeting of the American Academy of Orthopaedic Surgeons, Memphis, Tennessee, January 17, 1939.

cases. It is time-consuming and expensive, and, therefore, is unjustifiable as a routine. If, after having had this experience, one believes posterior stripping will save time and afford relief, the operation is advised without delay.

TECHNIQUE OF POSTERIOR FASCIOTOMY

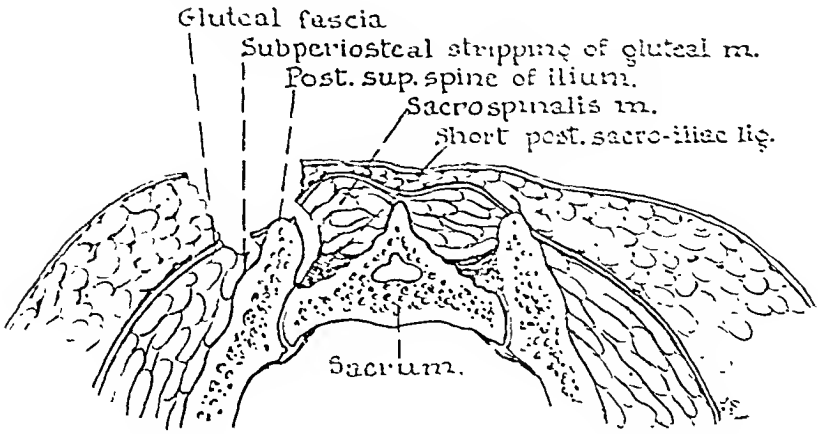
A curved incision, about four inches long, is made over the posterior portion of the crest of the ilium and extended about one inch below the posterior superior spine. The gluteal fascia, attached to the lateral lip of the crest of the ilium and to the posterior superior spine, is stripped aside



Freeing posterior ilium of fascial and muscle attachments.

FIG. 1

subperiosteally down to the superior gluteal line and to the upper margin of the greater sciatic notch. Subperiosteal stripping is then continued along the medial surface of the posterior superior spine to the sacrum, and inferiorly to the posterior inferior spine. This removes the iliac attachments of the long and short sacro-iliac ligaments. If there has been tenderness over the sacrospinalis fascia between the posterior superior spine and the lumbar vertebrae, this fascia is also divided transversely. This is readily exposed by retraction of the skin medially. This completes the



Freeing posterior ilium of fascial and muscle attachments.

FIG. 2

operation, and the wound is closed by means of subcutaneous and skin sutures. No postoperative fixation is recommended. The patient is kept in bed for a few days and then allowed activities according to his inclination.

RATIONALE OF POSTERIOR FASCIOTOMY

It is not the author's conception that the stripping of fascial and ligamentous attachments at the posterior structures relieves tension or irritation on the sciatic nerve. There can be no direct relationship. Pain may be relieved: (1) by releasing strain at the site of the insertion of the muscle; (2) by relieving muscle spasm or the tension of an inelastic muscle; and (3) by releasing fascial or ligamentous strain.

1. In the presence of a strain of muscle attachment, there is pain when the muscle is actively contracted against resistance or when it is passively stretched. Usually there will be found a localized area of tenderness at the insertion of the tendon. According to Sir Robert Jones: "This tender spot is the key to the situation. It is a small patch of effusion below the periosteum or in the fibers of the tendon which run in and through the periosteum to the bone, constituting the origin or insertion of the muscle. The pain is due to tension on this effusion caused by tension on the muscle or by direct pressure on the edematous spot." It is, then, conceivable that subperiosteal stripping of a muscle from its bone attachment may relieve the syndrome of muscle strain.

2. According to the classical work of Llewellyn and Jones, fibrositis or myositis may be the result of infection, toxin, or trauma, and is accompanied by a hyperplasia of connective tissue in the muscle. Infection or trauma makes the sense organ located in the tendons hypersensitive, resulting in an increased muscle tone. In the acute case muscle spasm causes a collapse of the veins, which are more compressible than the arteries, and the engorgement of blood into the muscles causes swelling and heat. The condition becomes chronic when this circulatory stasis stimulates an overgrowth of fibrous elements, resulting in diminished

determining the seat of origin of pain, but it cannot be accepted as the sole differentiating criterion.

SELECTION OF CASES SUITABLE FOR FASCIOTOMY

The selection of cases for operation is a difficult problem, and it is regrettable that no reliable single test or sign has been found. Since it is the author's conception that pain in the cases under discussion is caused by a local irritation at the site of the periosteal attachment of muscles, fascia, or ligaments, or by a shortened fascia or inelastic muscle, one would expect localized tenderness and localized pain when these structures are put under tension. Tension is produced by passive stretching or active contraction against resistance. These findings are the ones upon which chief reliance is placed. Tenderness is localized at the posterior superior spine, at the posterior third of the crest of the ilium, or at the immediate vicinity of these structures laterally, medially, or inferiorly. Forward bending is generally limited and accompanied by local pain, particularly when the patient is standing. Active extension of the spine against resistance is likely to be painful. Straight-leg raising causes local pain and is generally limited. Lateral bending away from the affected side may be painful because of the stretching of the sacrospinalis fascia. Passive extension of the lumbar spine must be free and without pain, as this does not put the posterior soft structures under tension. Associated with these findings there may be a list. The patient generally complains of pain referred to the buttock and to the posterior aspect of the thigh and leg.

One must be convinced that arthritis of the lumbar spine or lumbosacral articulation is not the cause of symptoms before considering fasciotomy. In this condition motion is limited in all directions. The author does not believe that a coexisting asymptomatic and moderate degree of hypertrophic arthritis revealed only by the roentgenogram is a contra-indication to fasciotomy. It is evident, of course, that one must be assured, in so far as possible, that symptoms are not caused by nerve-root irritation, congenital anomaly, disease of the spinal or sacro-iliac articulations, postural strain, spondylolisthesis, lesion of an intervertebral disc or ligamentum flavum, tumor, or any of the other disorders which may be the cause of similar complaints.

A summary of the positive findings which suggest the application of posterior fasciotomy indicates that localized tenderness at or near the posterior superior spine is the most important single criterion. Painful forward bending, other motions being free, with painful straight-leg raising, is of almost equal importance. A positive response to novocain injection is most suggestive, and favors a good prognosis following posterior fasciotomy. The writer knows of no way by physical examination alone to differentiate this syndrome from sacro-iliac strain, subluxation, or disease, unless possibly by pain on compression of the iliac crests or by Gaenslen's manipulation.

The presence of these findings alone does not constitute sufficient

justification for operation. Non-operative treatment still must occupy the most important place. Operation is proposed only when conservative treatment has not brought relief or is not likely to do so.

It may occur to the reader that the cases selected for operation as outlined in this paper may yield to manipulative treatment, either stretching under anaesthesia or according to the method of Jostes. This may be true in some cases. Fewer manipulations under anaesthesia have been done since the advent of fasciotomy, because the latter is attended by less danger and, the author believes, by better results.

The advantages of posterior fasciotomy over arthrodesis of the sacro-iliac joint are apparent. It is a comparatively simple operation and allows the patient to resume his activity as soon as the wound is healed. Experience has shown that, when there is no lesion revealed by the roentgenogram, fasciotomy apparently affords the same degree of relief as does radical arthrodesis. The author has done only one arthrodesis of the sacro-iliac joint for the relief of so-called sacro-iliac strain during the past three years. At the University Hospitals in Cleveland, arthrodesis has been almost entirely supplanted by one or the other methods of fasciotomy: posterior stripping, division of the fascia lata, or a combination of the two at one operation.

ANALYSIS OF RESULTS

The substance of this paper is based on a total of thirty-seven consecutive fasciotomies. Posterior fasciotomy alone, as described in the preceding discussion, was done in twenty-two cases; division of the fascia lata alone, in twelve cases; and a combination of these two operations through separate incisions, in three cases. While the primary object is to report only the results of posterior stripping, the results of division of the fascia lata are also noted. The number of cases analyzed is too small to permit conclusions as to the relative merits of these two methods, and interest has been centered chiefly upon the posterior operation. Results are expressed in tabular form (Table I) and are classified as "good", "fair", and "failure". A good result is recorded when the patient has obtained complete relief or has only minor symptoms, which are in no way disabling. A fair result is recorded when the patient has been greatly relieved of his major complaint and, while he may continue to have some discomfort, he is no longer seeking relief. A failure is recorded when the patient has had little or no relief.

Posterior fasciotomy was done upon twenty-two patients, sixteen of whom were markedly relieved before discharge from the hospital. There was partial relief before discharge in three cases, and no relief in three cases. The final results of twenty-one operations are known: sixteen, or 76 per cent., of the patients are well; two, or 10 per cent., are partially relieved; and three, or 14 per cent., are not relieved. Division of the fascia lata was done upon twelve patients. The final results of eleven of these operations are known: five, or 45 per cent., of the patients are well; one, or 10 per cent., is partially relieved; and five, or 45 per cent., are not re-

TABLE I

RESULTS OF THIRTY-SEVEN CONSECUTIVE FASCIOTOMIES

Operation	Cases	Immediate Result			Known End Result		
		Good	Fair	Failure	Good	Fair	Failure
Posterior fasciotomy	22	16	3	3	16 (76%)	2 (10%)	3 (14%)
Division of fascia lata	12	4	2	6	5 (45%)	1 (10%)	5 (45%)
Combined	3	3	0	0	?	?	1

lieved. A combined operation was done upon three patients. The result of only one of these is known. The patient was not relieved.

The immediate result—that is, the state of the patient at the time of his discharge from the hospital following operation—is also indicated. In the follow-up study there was found a striking parallel between the immediate postoperative result and the permanent or end result. It would appear that when the patient is immediately relieved he is likely to remain so, and when there is no relief immediately after operation there will likely follow no subsequent improvement. This is what one would expect after thinking upon the conception expressed in this paper that relief of pain is not accomplished by any secondary correction of mechanical strain at the lumbosacral or sacro-iliac articulations.

In this series of cases there are recorded three failures following posterior fasciotomy. In one of these cases the patient had a congenital deformity of the sacrum, and for several years had been suffering with severe local pain associated with sciatica. Compression of the iliac crests was acutely painful. Arthrodesis of the sacro-iliac joint was advised, but we were prevailed upon to do a fasciotomy. The patient was not relieved, although subsequently she obtained complete relief by arthrodesis. It is interesting to note that pain on compression of the iliac crests was absent after fasciotomy. In the other two cases recorded as failures the Ober operation was subsequently done; this also failed. The roentgenogram of one of these patients revealed a considerable degree of hypertrophic arthritis of the sacro-iliac joint. Obviously the operation was not applicable. No reason can be attributed to the failure in the third case, unless the fact that there was also tenderness at the lumbar region indicated a lesion elsewhere.

While not included in this report, division of the sacrospinalis fascia alone has been done in a few cases when this fascia appeared to be definitely taut and tender to pressure. These cases have been too few to justify more than favorable impressions.

The following case histories of two patients are recorded in order to exemplify the type of case under discussion. One of these patients had local back pain with sciatica; the other had local back pain without sciatica.

CASE 1. Mrs. T., aged thirty-three years, had been complaining of pain at the region of the right sacro-iliac joint for seven years. Pain originally appeared during the later stage of pregnancy, and radiated down the posterior aspect of the thigh and leg. Treatment during four years had consisted of adhesive strapping, physical therapy, bed rest, the wearing of a special corset, a plaster jacket, and a manipulation under general anaesthesia. Streptococcus-vaccine treatment over a period of six months was tried without success. The patient had been comfortable during short intervals only.

On October 1, 1935, she was complaining of pain at the region of the right sacro-iliac joint. She stood with a moderate list to the left. Tenderness was localized at the posterior superior spine and at the lumbar fascia opposite the fourth and fifth lumbar vertebrae. Forward bending was moderately limited and painful. Straight-leg raising caused pain at 45 degrees. Compression of the iliac crests did not cause pain. Roentgenograms of the lumbar spine and pelvis were negative. Novocain (fifteen cubic centimeters of a 1-per-cent. solution) was injected into the periosteum covering the posterior superior spine and into the fascia in the immediate vicinity. Following this injection, the patient was greatly relieved for several hours and could bend forward without pain.

On November 11, 1935, stripping of the posterior superior spine was done, and the lumbar fascia was divided transversely. The patient was discharged from the hospital on the sixth postoperative day, and was greatly relieved. She was last examined two years from the date of operation and stated that during that period there had been no recurrence of pain.

CASE 2. Mrs. P., aged thirty-eight years, had been having continual pain at the region of the left sacro-iliac joint during a period of five years. Pain did not radiate. Treatment directed toward a possible arthritis had been carried out by an internist, without relief. The patient had then resorted to chiropractic treatments and was not relieved. When first examined, she was wearing a Goldthwait back brace and said that she could not get along without it. Arthrodesis of the sacro-iliac joint had been advised by a well-known orthopaedic surgeon.

Examination on June 14, 1937, revealed little except for acute tenderness localized over the posterior superior spine and sacro-iliac ligaments. Straight-leg raising was not limited and was only moderately painful. The thoracic and lumbar curves were moderately exaggerated. There was no list. There was good motion in the lumbar spine, although forward and right lateral bending caused pain. Compression of the iliac crests was negative. Roentgenograms of the lumbar spine and pelvis revealed no abnormality.

A posterior fasciotomy was done on June 15, 1937. The patient was discharged from the hospital on the fifth postoperative day greatly relieved. In a recent communication she says that she has not worn the brace since the operation and has had no pain.

SUMMARY

By means of the posterior fasciotomy described, good results with lasting relief were obtained in sixteen, or 76 per cent., of the twenty-one cases followed. It is believed that this operation will supplant to a large degree radical arthrodesis of the sacro-iliac joint when this is not the seat of a lesion demonstrable in the roentgenogram.

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OSTEOCHONDROMA OF THE FIBULA WITH RESULTANT FOOT DROP

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From the Orthopaedic Division of Blodgett Memorial Hospital, Grand Rapids

Benign bone tumors are noted most frequently during adolescence. These are often brought to light because of slight deformity or during roentgenographic examination. Occasionally one is suspicious of their presence in the face of a bursitis, a stiff joint, soft-tissue irritation, or actual tumor presence. Rarely do such growths demand immediate surgical intervention because of complicating nerve involvement.

The following two cases are reported because the symptoms presented indicated progressive nerve involvement with interference of locomotion.

CASE 1. N. H , male, aged fifteen years, entered the Orthopaedic Service of Blodgett Memorial Hospital on October 30, 1937 He complained of pain in the left lower leg and weakness in the foot with "curling under" of the toes Ten months previously he had fallen from a bicycle, hitting the left knee Two months later, he had noticed a slight swelling just below and lateral to the left knee At this time he noticed that the left foot became tired very quickly and felt weak During the three months prior to examination, this weakness had progressed, so that he limped when tired, and during the two weeks previous to admission he had been unable to stand on the leg more than fifteen minutes. A sharp shooting pain down the outside of the calf had also developed

Examination showed the patient to be a healthy young male The only positive findings were in the left lower leg Two inches below the head of the left fibula a mass, about the size of a small walnut, was palpable This was firm, non-tender, and fixed to the bone. On walking, the boy demonstrated a typical drop-foot gait. The left calf was one inch less in circumference than the right The left peroneal group was devoid of power. There was no dorsiflexion of the foot Sensation was absent over the dorsum of the fifth toe in the distribution of the sural nerve and inhibited in the distribution of the superficial peroneal nerve

The laboratory examinations were normal The Kahn test was negative. Roentgenographic examination revealed an osteochondroma, with a somewhat pedunculated contour, arising about two inches below the head of the fibula. The mass protruded laterally and posteriorly. (See Figures 1-A and 1-B.)

The tumor was removed surgically four days after the first examination. A lateral incision was made, exposing the greater portion of the peronei. This group was separated from the gastrocnemius down to the bone, and the tumor mass was visualized. The peroneal nerve was then isolated and found to be stretched downward and backward by the growth of the mass. After the nerve had been completely visualized, the growth was chiseled away at its base.

Microscopic examination substantiated the clinical and roentgenographic diagnoses The recovery was uneventful. Two weeks following the surgery, the boy was placed in a long caliper brace with a posterior lock at the ankle. Intensive physiotherapy was instituted for a period of two months At this time the atrophy was less evident

In March 1938 (five months following removal of the osteochondroma) the leg was judged to be normal.

CASE 2. F. H., male, aged fourteen years, entered the Orthopaedic Service of Blodgett Memorial Hospital because of pigeon-toed gait and an enlargement of the left calf. The boy had walked pigeon-toed for a number of months. The enlargement of the left calf had been noticed for a period of two months.

Examination revealed a healthy young male, presenting no physical abnormalities except for the left lower leg. There was a definite enlargement of the calf on the left. On palpation there was a tumor mass about the size of a small peach. This was firm and non-movable. No tenderness existed. The peronei were normal, also the tibialis anterior. The extensor hallucis longus was definitely weak. There were no sensory changes.

Laboratory examinations were negative. Roentgenographic studies revealed a

FIG. 1-A

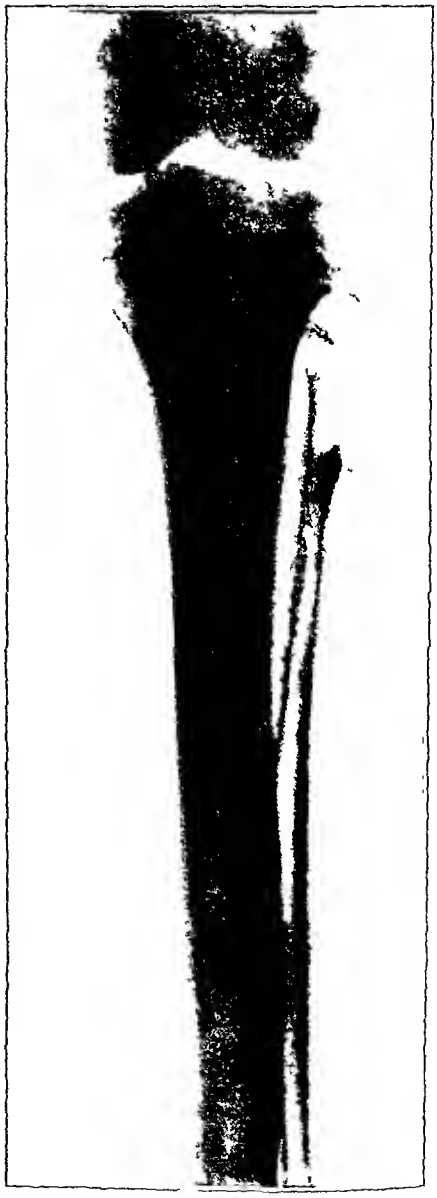

FIG. 1-B

Case 1. N. H., male, aged fifteen years. Osteochondroma of left fibula.

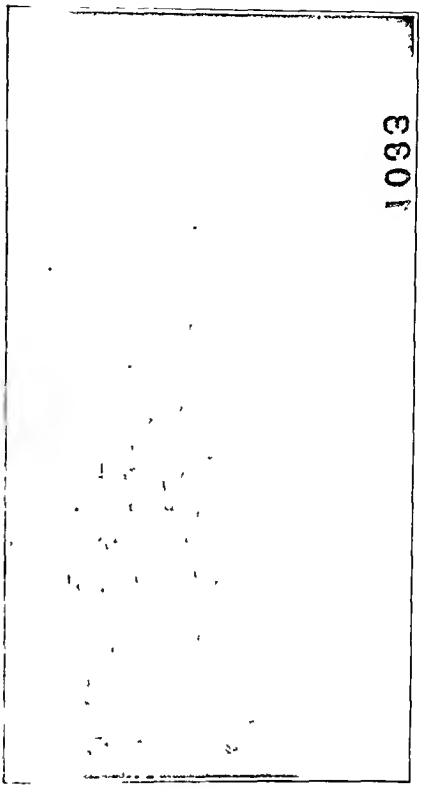

FIG. 2-A FIG 2-B

Case 2. F. H., male, aged fourteen years. Osteochondroma of left fibula.

proliferative growth at the upper end of the left fibula. This mass was apparently arising on the shaft from a broad base and protruding posteriorly. The periphery was irregular in outline. The general appearance was that of an osteochondroma. (See Figures 2-A and 2-B.)

Surgical excision was performed. The peronei were separated from the gastrocnemius. The common peroneal nerve was exposed and dissected from its bed for complete visualization of the region of the tumor. The nerve was displaced posteriorly. Because of the broad base of the tumor, the upper four inches of the fibula was removed, leaving the epiphysis. Healing was uneventful except for numbness in the region of the lateral sural cutaneous nerve.

Microscopic examination of the tissue substantiated the clinical and roentgenographic diagnoses.

No brace was applied. Six months later the numbness in the region of the sural nerve had disappeared. The power of the extensor hallucis longus had not been completely regained.

COMMENT

We are taught that osteochondromata can occur only where tendons or ligaments are attached directly to bone through a periosteal hiatus in a tubercle or tuberosity. The tendinous extremities possess remnants of embryological tissue, which develop directly from cartilage into bone. These fuse with bony proliferation through a hiatus in the normal periosteum. About this union the periosteum forms a cuff, which prolongs

SYNOSTOSIS OPERATION FOR PERSISTENT NON-UNION OF THE TIBIA *

A Case Report †

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In the majority of cases, non-union of the tibia is readily amenable to cure by means of a free bone graft, by drilling, or by other relatively uncomplicated methods. In occasional instances, however, even several such operations result in failure, due not to the technique employed, but to some fundamental change in the bone itself. In this event, more complicated procedures, such as those suggested by Huntington, Ollier, or Müller, have been performed satisfactorily.

In one such case, four operations, including three bone grafts, were unsuccessful and the necessity for reoperation presented itself. The patient refused to permit any further operative procedure on the well leg. When the Huntington operation was suggested, he demurred on the ground that failure might involve the possibility of amputation of the affected leg.

In this dilemma, a different plan of operation was devised. To the best of our knowledge the procedure has not hitherto been described. In principle, it consists simply of the formation of a cross union between fibula and tibia, resembling the undesired union occasionally obtained in the forearm bones. Part of the fibula is used as the graft, and part remains intact to act as a splint. This procedure appears to be superior to the Huntington operation in that it is a one-stage operation and, in the event of infection or other postoperative complication, the patient is not left with a flail leg. The operation is strictly indicated as a last resort. It is intended for use only when other simpler methods, such as drilling, grafting, packing with bone chips, etc., have failed. Since the likelihood of failure is much reduced by the use of one or more of these methods, it is obvious that the usefulness of the procedure must be limited. However, in the selected case of persistent non-union, in the case of congenital pseudarthrosis, or in the treatment of moderate-sized tibial defects, the method of synostosis may prove useful, if other methods have failed.

While the operative technique is somewhat complicated, the operation can be performed without too much difficulty, if due respect is paid to the anatomy of the part.

OPERATIVE PROCEDURE

A skin incision, extending from the level of the tibial tubercle to within two inches of the tip of the lateral malleolus, is made in the area

* Presented before the Orthopaedic Conference, The Hospital for Joint Diseases, October 25, 1938.

† From the Service of Harry Finkelstein, M.D.

between the crest of the tibia and the anterior border of the fibula. The skin is dissected medially to expose the tibia and laterally to expose the fibula. The superficial peroneal nerve is identified in the lower portion of the operative field, and, with this as a guide, the fascia is incised longitudinally along the course of the nerve. The fascial space between the peroneal muscles and the extensor digitorum communis is located, and the extensor muscles are separated from their attachment to the fibular periosteum throughout the length of the incision, leaving the fibular periosteum intact. The deep peroneal nerve is now identified in the upper angle of the wound, just beneath the lateral border of the extensor digitorum communis. The extensor group, the deep peroneal nerve, and the anterior tibial vessels are gently elevated from the interosseous membrane. A second fascial incision is made along the crest of the tibia, and the periosteal attachment of the tibialis anterior is separated from the lateral surface of the tibia, leaving the tibial periosteum intact. The whole mass, wrapped in a moist laparotomy pad, is lifted up, exposing at the bottom of the wound both fibula and tibia, covered by periosteum and united by the dense interosseous membrane. The tibial periosteum is incised along the lateral margin of the tibia. By the careful stripping of tissue and by the making of cross cuts at the upper and lower ends, the periosteum of the lateral surface of the tibia can be reflected as two large flaps. The periosteum of the fibula is incised along the anteromedial border and turned medially and downward upon the interosseous membrane. A bone flap, consisting of the lateral half of the tibia, is cut with the osteotome and turned outward, so as to lie upon the interosseous membrane and the reflected portion of the fibular periosteum. To ensure better bone contact, this bone flap may be tucked beneath the fibula. The fibula is then split longitudinally, and the fragments are crisscrossed over to the remaining intact portion of the tibia. To ensure their position, a kangaroo tendon is passed through two drill holes made in the remaining portion of the crest of the tibia and lashed around the fibula. The periosteal flap from the tibia is drawn across and sutured to the cut fibular periosteum along its anterolateral border. The extensor-muscle mass is permitted to drop back into place above the periosteum, and the fascial incisions are closed. The various steps in these procedures are shown in Figure 1. After suture of the skin incision, a snug plaster-of-Paris bandage is applied, immobilizing the knee and the ankle. This is left on until a roentgenogram demonstrates the presence of firm bony union.

CASE REPORT

P. F. (No. 67490), male, aged twenty-three years, was injured in a motor accident in 1923. Among other injuries, he suffered a compound fracture of the right tibia. Some sort of open operation, probably a débridement, was performed at a Central American hospital. Infection developed, and union did not occur. Some eight months later, a bone-graft operation was performed, but without success. Later, the patient came to the United States with a discharging sinus, which ultimately healed, leaving the tibia

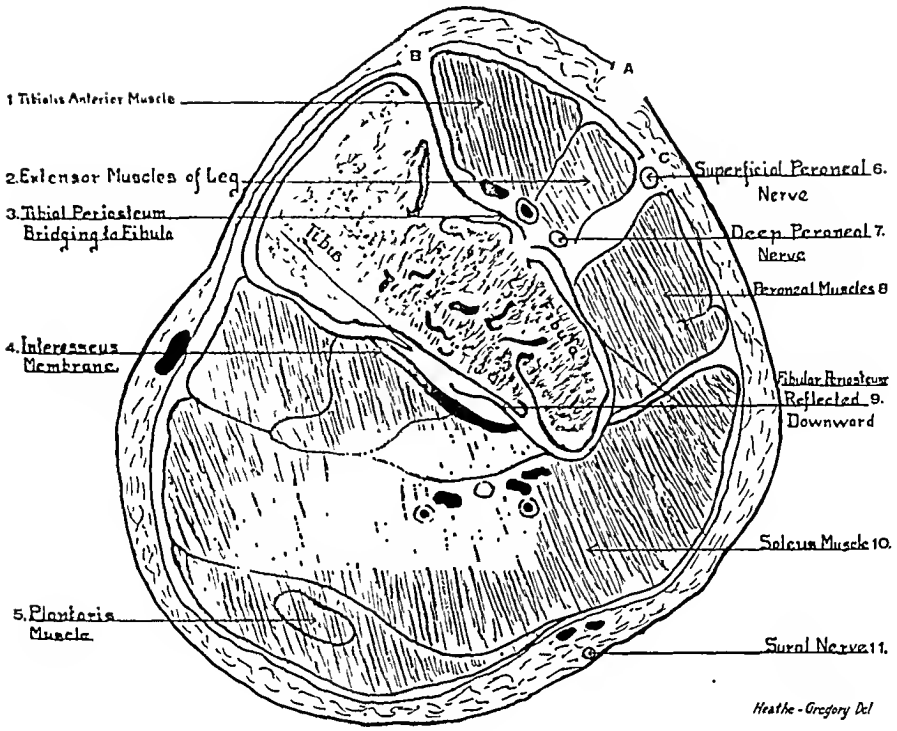

FIG. 1

Schematic cross-section of the leg at its middle third. At *A* the skin incision in the interspace between the crest of the tibia and the fibula is indicated by a break in the skin outline. At *B* and *C* the break in the fascial line indicates the points at which the anterior group of muscles, along with the anterior tibial nerve and vessels, are longitudinally separated to permit elevation from the interosseous membrane, which is shown by the heavy black line. The medial portion of the fibular periosteum lies upon the interosseous membrane, and upon this the lateral wall of the tibia has been broken down and tucked under the remaining portion of the shaft of the fibula. The space between tibia and fibula has been filled in with fragments of bone. This whole mass is then covered over by the tibial periosteum, which has been pulled beneath the extensor-muscle mass and has been sutured to the cut edge of the fibular periosteum.

still ununited. In 1926, the patient was admitted to the Hospital for Joint Diseases for a bone-graft operation, which was performed by the usual technique on June 10, 1926. After a short time the wound became infected and broke down. Healing occurred by secondary intention, leaving non-union at the site of fracture. In 1934, the patient was readmitted to the Hospital, and a third and very stout free graft from the well leg was transplanted into the affected leg. Primary union occurred, and the patient was discharged in plaster on February 11, 1935, after a three-month stay in the Hospital. In April a walking plaster was applied and was left on for several months. After this the patient was permitted to walk about normally. Interval check-up roentgenograms showed some thinning of the graft at the level of the old non-union, which could still be visualized. Despite this, the patient had no difficulty for about two years, when he slipped, and the leg was refractured through the original fracture site. A plaster was applied, and later a walking brace was fitted to the patient in the hope that union might occur under the influence of use. This hope proved to be vain. Because of the patient's insistence that something be done for him, and because of his refusal to permit further operation upon the well leg, it was decided to attempt the making of a cross union between the tibia and the fibula. Therefore, the patient was again admitted to the Hospital in November 1937.

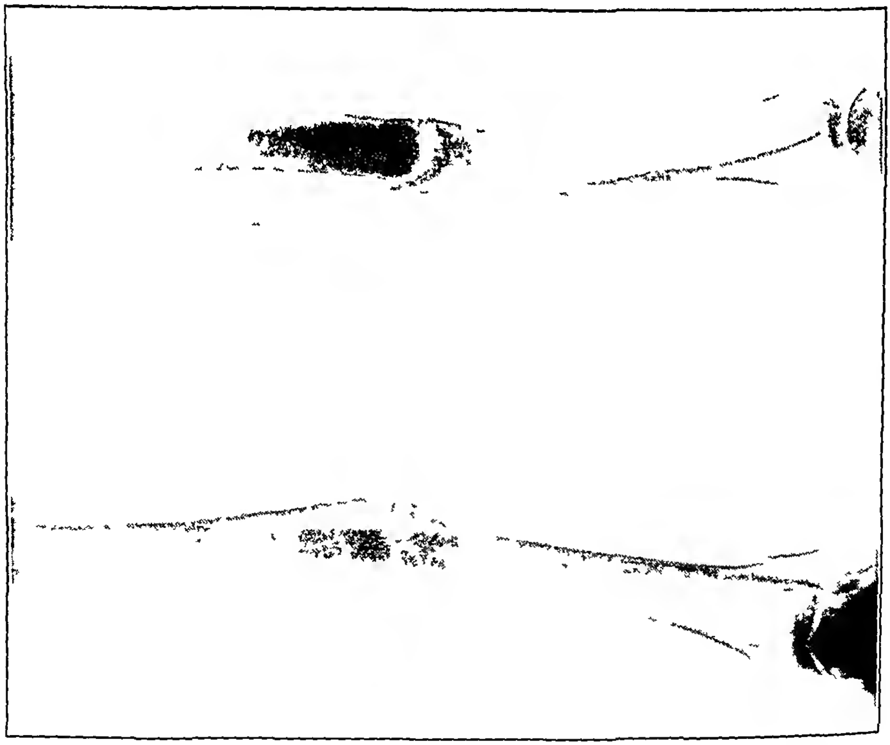

Fig. 2

Roentgenograms of leg taken some time before synostosis operation.

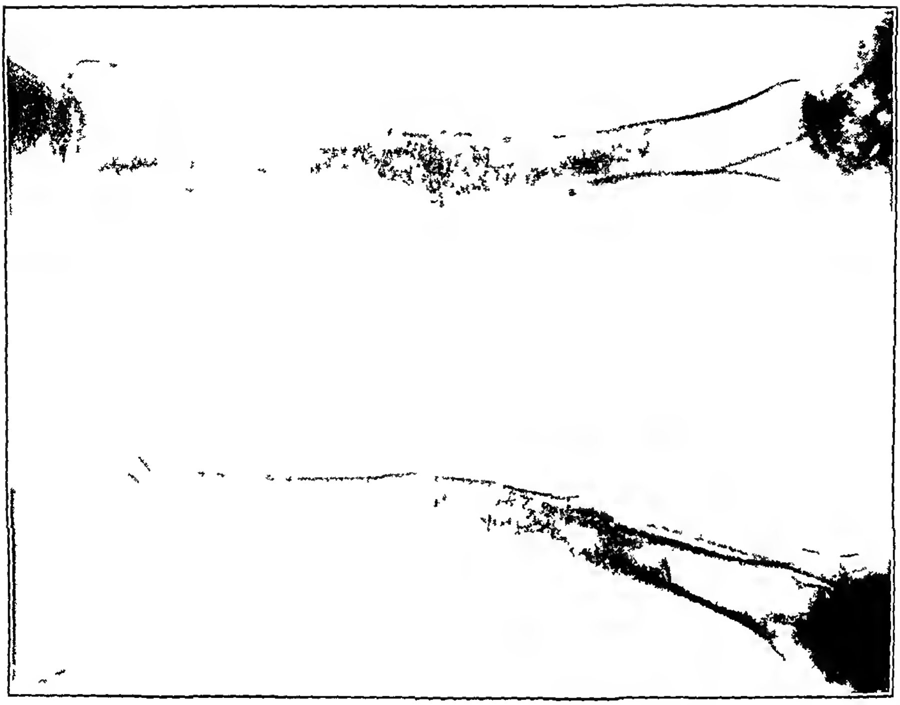

Fig 3

Roentgenograms taken after operation. There has been a slight increase in the bowing of the leg.

Upon admission, the typical picture of non-union was found (Fig. 2). The remnants of the previous graft were still faintly outlined, and it was seen that refracture of the graft had occurred at the level of the original fracture. On November 11, 1937, an operation was performed under general anaesthesia. The tibial bone was found porotic for several inches on either side of the fracture. It was considered completely unsuitable for any further bone grafting or drilling. The synostosis described was carried out. Following operation, the patient suffered a circulatory collapse, from which he recovered with some difficulty. Thereafter, however, the convalescence was uneventful. Roentgenographic examination showed the bone bridging the interosseous space from tibia to fibula. Subsequent roentgenograms showed the gradual appearance of callus between these fragments. To guard against the possibility of premature weight-bearing, a new walking plaster was applied in March 1938. This was removed in July 1938, and the patient was fitted with a brace and was permitted to begin walking. In September 1938, the patient was seen in the Out-Patient Service and stated that he had not worn the brace since August. The patient has continued walking without any leg support. Check-up roentgenograms (Fig. 3) demonstrate the solidity of the union. There has been a moderate increase in bowing of the leg. A gradual increase in bowing has been noted since the occurrence of the accident and, in our opinion, is to be attributed to the loss of tibial support, rather than to the effects of any of the previous operations.

Despite the fact that there has been a moderate increase over the amount of bowing present before the last operation, the patient is eminently satisfied with the result.

At the time of presentation of this case, some question was raised as to the increased bowing which developed after operation. Although it is our opinion that the bowing is not a necessary consequence of the operation itself, this can only be determined by the observation of other cases. It would seem that, if this proved to be the case, it might be corrected by wedging the plaster during the period of consolidation. The possibility of correcting this deformity at the present time by means of a high tibial partial osteotomy has been explained to the patient. However, it is not surprising that for the present the patient has refused to permit any further intervention.

CONCLUSION

The operative procedure described for the treatment of persistent non-union or bone defects in the tibia is intended as a last resort in cases in which the simpler, more routine operative measures have failed. In general, the indications are those for the Huntington operation, and it is believed that the risks of a subsequent operation may be minimized by employing the procedure here described.

GENERALIZED MYOSITIS FIBROSA

Report of a Case

BY DONALD C. SOMERS, M.D., DETROIT, MICHIGAN

From the William J. Seymour Hospital, Eloise, Michigan

Janicke, in 1895, first described the syndrome now generally known as myositis fibrosa. In 1932, Schwab, Brindley, Bodansky, and Harris reviewed the literature, finding four authentic typical cases and three atypical cases, and listed an additional typical case of their own. In 1935 Ornsteen reported an additional atypical case, which he termed fibromyositis.

Due to the paucity of primary generalized affections of the muscular system, considerable confusion exists regarding the nomenclature. Schwab and his co-authors make no attempt to classify muscle-disease entities, but they classify the primary inflammatory diseases of the muscles as follows:

Acute and Subacute Myositis:

1. Primary suppurative (only occasionally generalized);
2. Trichinella spiralis infestation;
3. Dermatomyositis;
4. Polymyositis haemorrhagica;

Chronic Myositis:

1. Chronic dermatomyositis;
2. Myositis ossificans progressiva;
3. Myositis fibrosa.

It is questionable whether the chronic primary myositides should be classified as inflammatory, inasmuch as they are purely degenerative in nature and have never been proved etiologically to be associated with infection, either primarily or secondarily, in any way. One of the chief characteristics of all the cases reported has been their afebrile nature. Blood studies have likewise tended to confirm this view. Schwab believes that from the histological standpoint these cases fall within the rheumatoid or arthritic syndrome.

Although pathologically myositis fibrosa may be akin to fibrositis, there is quite convincing evidence that the latter disease is rather intimately associated with focal infection, while the evidence in myositis fibrosa has been distinctly not that of infection. Further, it would seem wise, for the sake of clinical lucidity, wherever possible to remove proved disease entities from the rheumatoid syndrome, rather than to add to that already overburdened group.

Others have attempted to show some similarity between this disease and progressive myositis ossificans. Although the pathological changes

are quite dissimilar in character, authors have had a tendency to group myositis ossificans, calcinosis universalis, dermatomyositis, and myositis fibrosa into one category. While these diseases do have some common features, certainly their most common feature is their obscure origin. From our studies on the case herein reported, combined with data on the other published cases, it would seem that the disease is metabolic in origin, but certainly of a very obscure nature.

CASE REPORT

H. H., a white male, aged fifty-three, entered the William J. Seymour Hospital on August 7, 1937, with a complaint of ulcers on both legs and a gradually progressing stiffness of both lower extremities and the back. In July 1937, he had noticed stiffness involving both lower extremities. He entered the Hospital for treatment of varicose veins, to which he attributed the increasing stiffness of the lower extremities. He had noticed stiffness in the back, but was unaware of any involvement of the arms. Freedom from pain was characteristic throughout the illness.

Except for a history of chronic asthma, extending over several years, his past history was negative.

Physical Examination

The patient was a well-developed and well-nourished white male. He was able to move quite freely in bed without pain. The skin showed a slight general increase in pigmentation and felt somewhat thickened, particularly over the thighs. A deviation of the nasal septum and hypertrophy of the turbinates were noted, and polypi were present in the right fossa. There was no difficulty in breathing, and all muscles of respiration were apparently normal. Examination of the heart was negative, although this patient's ultimate death was ascribed to coronary embolism. The abdomen was quite rigid, due to the inability of the patient to relax the abdominal muscles, rendering intra-abdominal palpation impossible. There was a small fibrous tumor, the size of a five-cent piece, adjacent to the umbilicus. The prostate was enlarged, boggy, and tender. The tone of the rectal sphincter was approximately normal.

When palpated, the musculature of both lower extremities, of the spine, and of the abdomen felt firm, resistant, and like a sandbag. There was apparently little or no atrophy of the involved musculature. On motion, the involved musculature seemed to have lost all

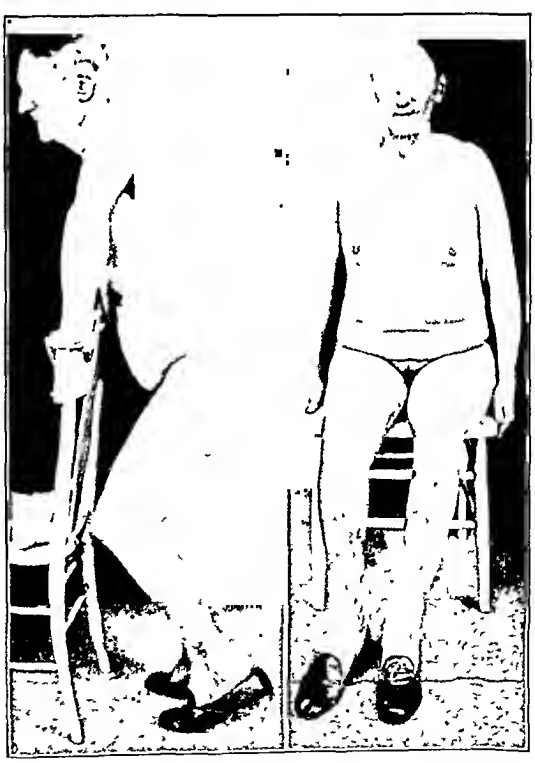

FIG. 1

Demonstrating flexion deformities of knees and hips. Note rigidity of back.

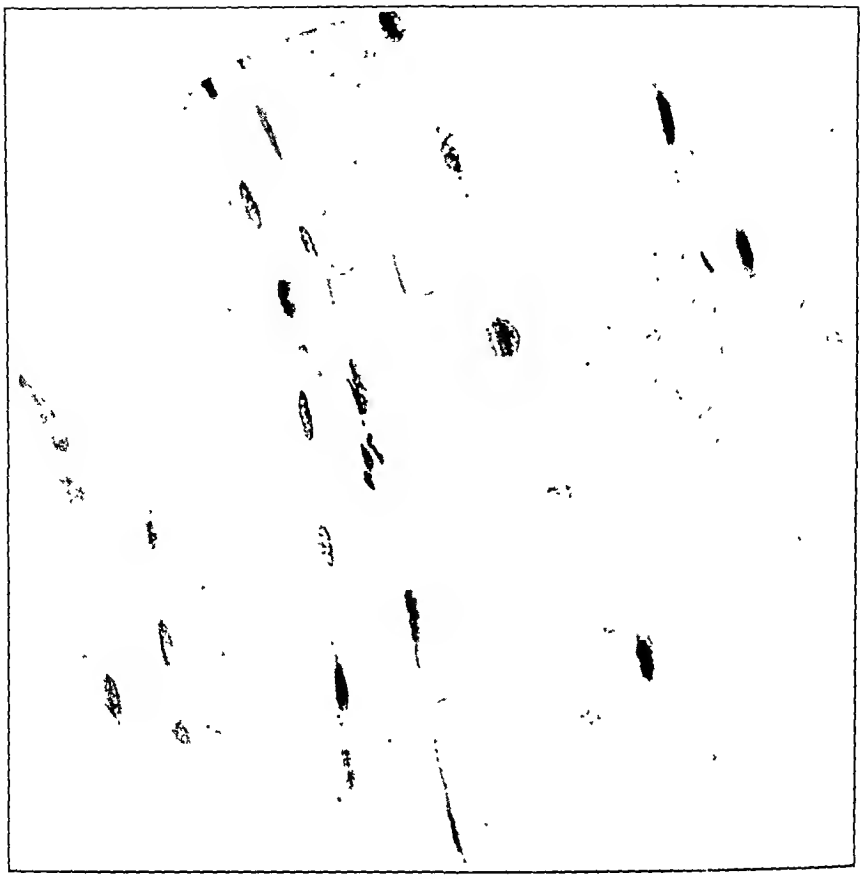

FIG. 2

Photomicrograph (×500) of quadriceps muscle of right thigh, demonstrating area of early change at 10:00 o'clock position, consisting of loss of striations.

elasticity, although firm contraction was still possible. The ankles were practically rigid in 20 degrees of equinus. The knees were drawn up in about 45 degrees of flexion. A range of 40 degrees of free painless motion was present in both knees. Both hips were in a neutral position as to abduction. There was a 50-degree flexion deformity bilaterally. A painless range of 60 degrees was present in flexion. Rotation and abduction were completely lost. There was no swelling or joint involvement whatever, other than the limited motion due to muscle contracture. Both legs showed extensive pigmented scarring above the ankles, resulting from old infected varicose ulcers. The pectoral musculature and all musculature of the shoulders and arms, while having a firm, doughy feeling on palpation, had not contracted sufficiently to prevent a full range of motion. The cervical musculature and sternocleidomastoids were indurated, and their range of motion was considerably limited. However, they were considerably more supple than the lower spinal musculature. No true muscle spasm or spasmodic contractions were noted at any time during the examination. The neurological consultant found no pathology. The dermatologists noted the varicose ulcers, but excluded dermatomyositis because of the absence of skin lesions.

Laboratory Findings

Blood studies showed a mild secondary anaemia. Calcium-phosphorus and creatinine determinations gave normal values.

Roentgenographic studies of the left hip and knee were negative for joint pathology.

FIG. 3-A

Photomicrograph (×1000), demonstrating almost complete loss of cross striations. A faint zone of cross striation may still be seen at 2 00 o'clock position.

FIG. 3-B

A section of normal striated musculature of like magnification is shown for comparison.

However, the left femur revealed a definite periostitis, which was evidently of long duration. The roentgenographic diagnosis was luetic periostitis. Inasmuch as no evidence of syphilis could be found, either through history, clinical examination, or serology tests of the blood and spinal fluid, a diagnosis of syphilis could not be made.

Course in Hospital

The varicose ulcers healed promptly following saphenous-vein ligations on August 10, 1937. On October 2, 1937, the patient began to have moderate asthmatic attacks, which cleared up promptly with adrenalin At this time also, the heart sounds were becoming roughened, and a questionable systolic murmur developed in the aortic area and a systolic murmur at the apex. On October 8, 1937, polypi were removed from both nasal fossae. This procedure immediately alleviated the asthmatic condition.

Iron medication was given to combat the mild anaemia, but nothing further was done until February 5, 1938, when the contractures were manipulated under nitrous-oxide anaesthesia and found to be extremely resistant to correction. The anaesthesia caused no further relaxation than was present during the conscious state. A biopsy from

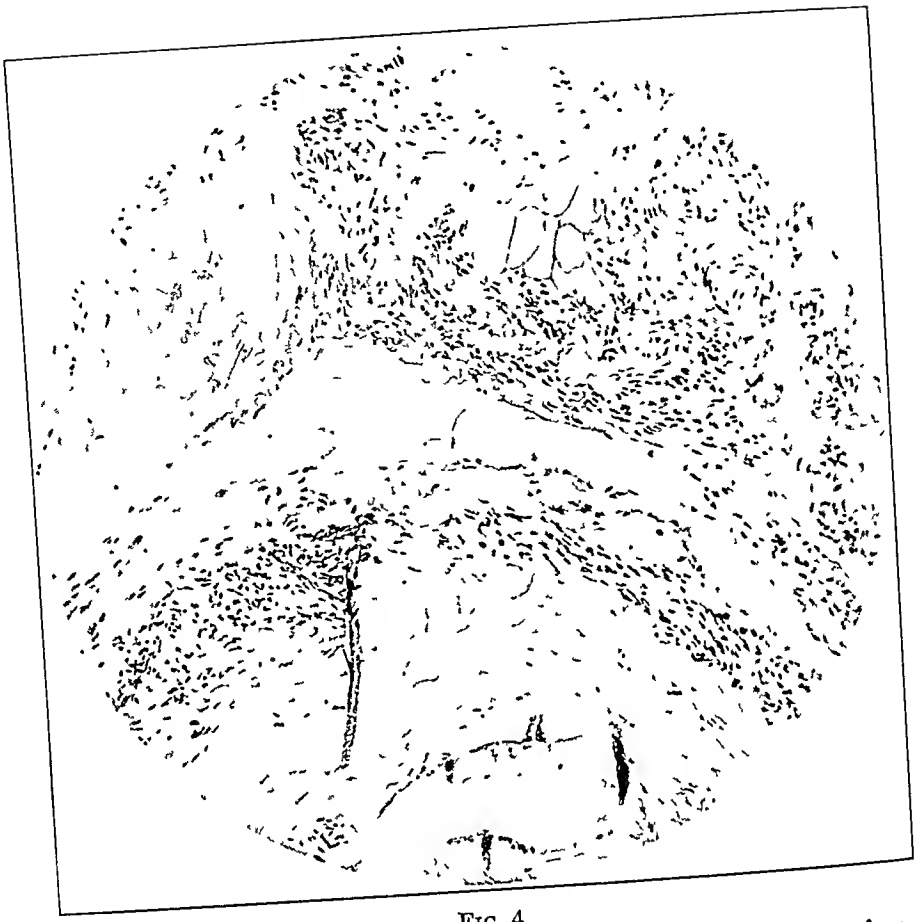

FIG. 4

Photomicrograph (×100), demonstrating small round-cell infiltration, fragmentation of muscle fibers, and fibrosis.

the right quadriceps muscle was done. Casts were applied for the purpose of wedging out the knee contractures. The postoperative course was uneventful until the fifth day, when the patient suddenly became comatose and died, probably from coronary thrombosis. Unfortunately, post-mortem examination was denied.

Microscopic Pathological Examination

The microscopic pathological description by Dr. S. E. Gould is as follows:

"*Anatomical Source of Specimen* Quadriceps femoris, right leg.

"*Microscopic* Many of the muscle fibers are thickened up to twice normal size and show partial or complete loss of the cross striations. A number of muscle fibers appear to be fragmented transversely or obliquely. In some fibers, areas of relatively normal striation alternate with pale areas of degeneration, in which the striation has disappeared. There is a good deal of oedema. The space between adjacent muscle fibers is increased, and the blood capillaries are prominent. The endothelial cells of the capillaries are prominent. The endothelial cells of the capillaries and small arterioles show active proliferation. The perimysial fibrous connective tissue is also markedly increased, and there is some active fibroblastic proliferation, including a number of fixed wandering cells, a few scattered lymphocytes, and a few eosinophilic and neutrophilic polymorphonuclear leukocytes.

"Summarizing then, we have a case of progressive stiffening of the musculature involving practically all the voluntary muscles of the body except facial, sphincteric, and

respiratory, beginning in the lower extremities, abdomen, and back, producing severe contractural deformities complicated by varicose ulceration of the legs, periostitis of the femur, and anaemia. Death resulted in eight months from probable coronary occlusion."

COMMENT

Involvement of the cardiac musculature is questionable, for, although the heart sounds became roughened and murmurs developed, proof of involvement could be determined by autopsy only, which was not permitted. This case was unquestionably still in the process of development when death intervened. Therefore, the time period of eight months has no significance.

The findings in this case which are consistent with previously reported cases are:

1. Insidious onset;
2. Progressive character;
3. Absence of facial and sphincteric involvement:
4. Afebrile course of disease;
5. Typical sandbag-like feeling of the more radically involved musculature;
6. Typical histopathological findings.

The findings in this case which are inconsistent with previously published cases are:

1. Age of fifty-three—the oldest previously reported case was that of a white male, aged forty-two (This is exclusive of Gies's case, which was probably a dermatomyositis.);
2. Complicating factor of varicose veins and varicose ulcers;
3. Lack of involvement of respiratory musculature;
4. Existence of a low-grade periostitis;
5. Absence of spasmodic contractions.

TREATMENT

Treatment in all cases except that of Burton, Cowan, and Miller, has been unavailing. In this case, manipulation under anaesthesia to correct deformity was attempted, but little correction was obtained. Because of the extreme fibrosis, correction could not be obtained by this method without using dangerously severe manipulation. As in progressive deforming arthritis, it would seem more logical to prevent deformities through orthopaedic measures than to correct them.

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REGENERATION OF THE LATERAL CONDYLE OF THE HUMERUS AFTER EXCISION

BY ALLEN F. VOSHELL, M.D., BALTIMORE, MARYLAND,
AND K. P. A. TAYLOR, M.D., HABANA, CUBA

The most common type of fracture involving the elbow in childhood is the supracondylar fracture with variations; next in frequency are the fractures of the single condyles, followed by the epiphyseal separations. When a fracture occurs, the loosened fragment assumes a displaced position consistent with the direction and amount of the fracturing force and the pull of the attached muscle structures, due to the small size of the fragment, the swelling of the whole region, and the traction force exerted by the irritated muscles with resultant displacement and torsion of the loose fragment. Closed reduction is difficult and usually inaccurate and incomplete, while immobilization is most uncertain and frequently impossible. Hence, open reduction and internal fixation are very frequently resorted to and offer the only certain procedure for union and early mobilization. Periodically a loose fragment, perhaps a whole condyle, may be removed in its entirety with or without the epicondylar epiphysis. The natural expectation following excision of the capitellum is that the elbow would become distorted, since the ulna should tend to slide laterally into the cavity left empty by removal of this bone; this would probably cause an increase in the carrying angle and changes in the amount of motion. To expect a regeneration of the lost condyle would be far beyond one's fondest hopes, and has never before been reported so far as can be determined.

In the following case the lateral condyle of the humerus (capitellum) was excised, followed by complete regeneration in two years with no postural or functional deformity or disability. Fortunately, as noted in the roentgenograms, the lateral epicondylar epiphysis was left behind, which may account for the development of a new unit. Peculiarly enough no functional disability has developed, and the only slight objective evidence of such an injury is a moderate prominence on the outer aspect of the elbow.

J. D., a white male, aged four years and nine months, fell from a horse on November 11, 1935, injuring his left elbow. He was seen by one of us (K. P. A. T.) on November 19, 1935. The elbow was swollen and motion was restricted to 15 degrees. Roentgenograms (Figs. 1-A and 1-B) revealed a fracture of the lateral condyle with full rotation and wide separation of the loose fragment. A consultant suggested that open reduction be done and the fragment be secured in place with kangaroo tendon or wire. This was undertaken under general anaesthesia on November 21, 1935 (K. P. A. T.). The detached bone fragment was excised, due to the impossibility of holding it in position. The elbow was suspended in the Jones position until December 3, 1935 (twelve days), when it was placed in a sling at an angle of 45 degrees, and free movement was permitted for short periods.

Roentgenograms (Figs. 2-A and 2-B), on December 5, 1935, revealed a small frag-

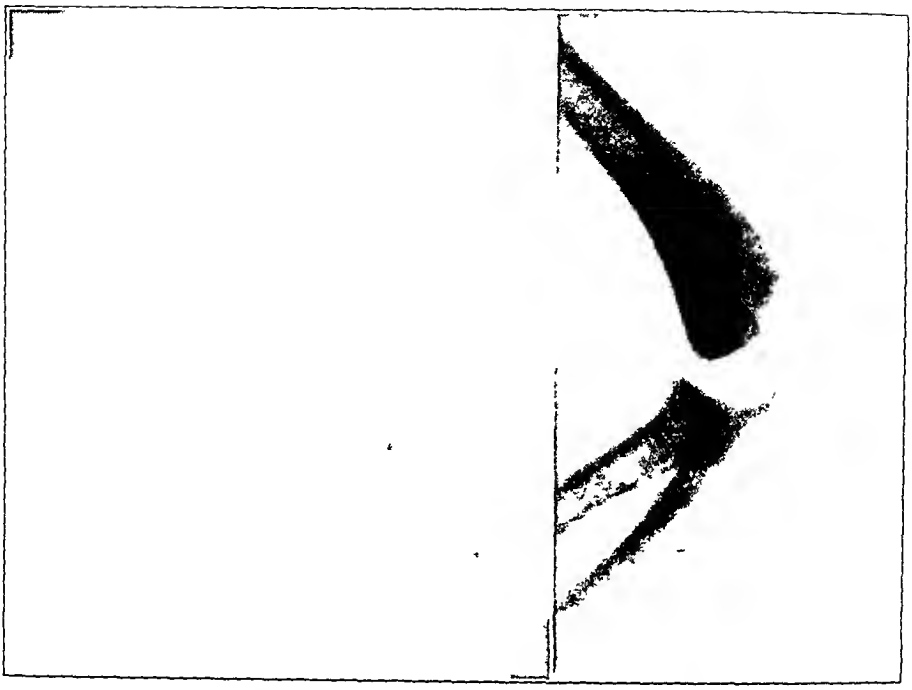

FIG. 1-A FIG. 1-B

Fracture of lateral condyle with displacement, eight days after injury.

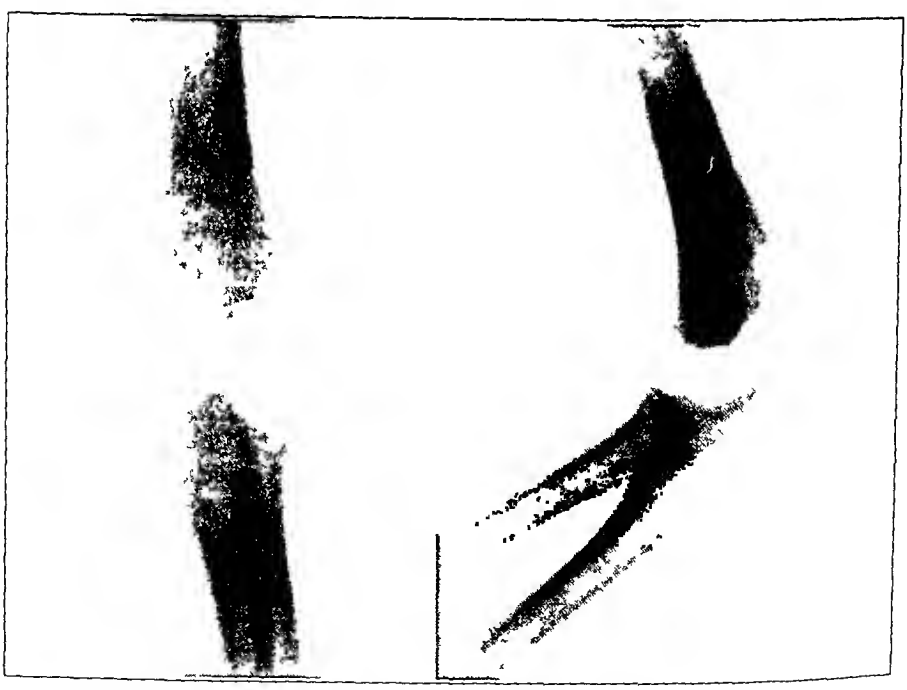

FIG. 2-A FIG. 2-B

Fourteen days after operation. Note epicondylar epiphysis.

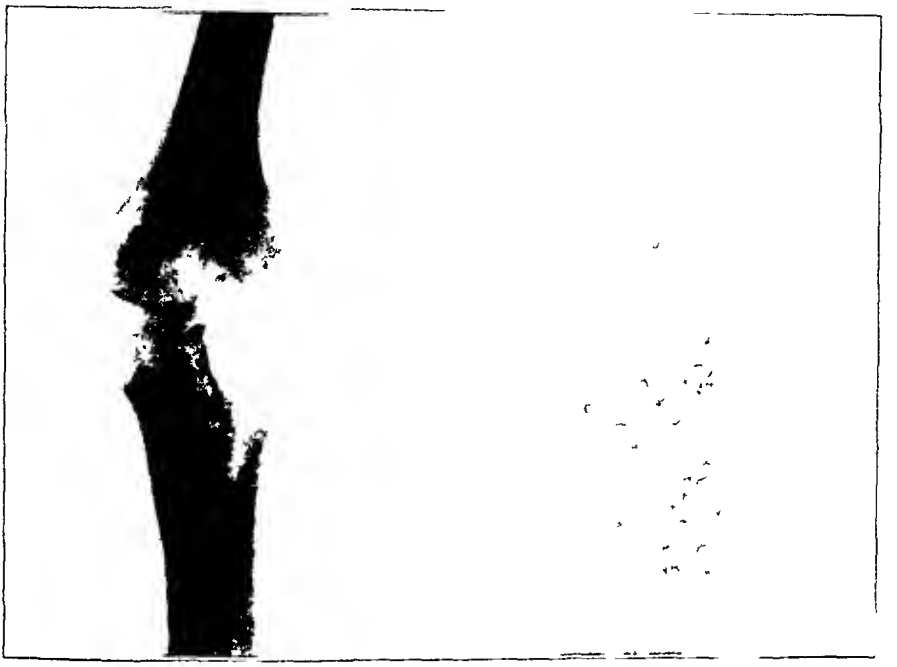

FIG. 3-A FIG. 3-B

Anteroposterior and lateral views of elbow nine months after operation. Regeneration of the lateral condyle of the humerus has progressed markedly.

FIG. 4

Eighteen months after operation.

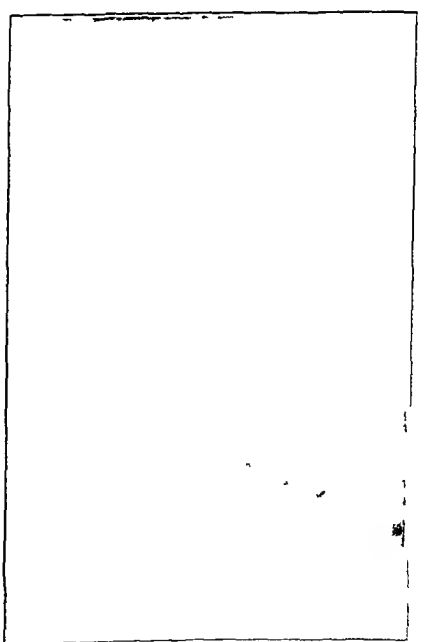

FIG. 5

Showing nearly full regeneration of the condyle.

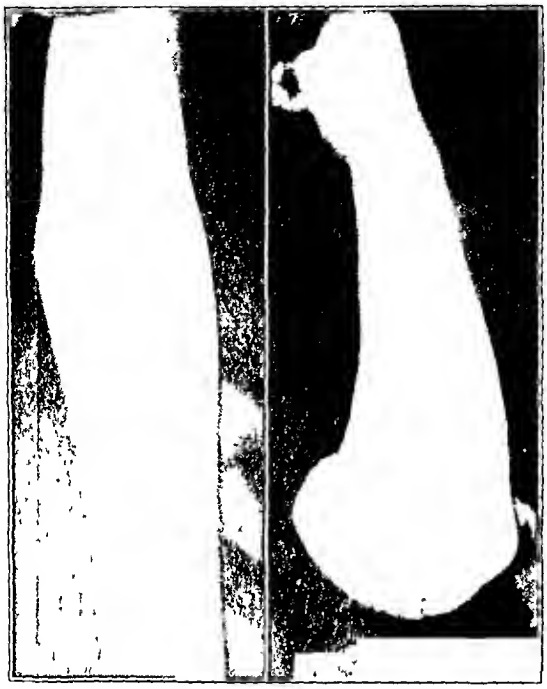

FIG. 6-A FIG. 6-B

Showing action of elbow. The only observable deformity is the prominence of the regenerated bone on the lateral side of the elbow.

ment of the epicondylar epiphysis which had not been excised and a fragment of bone in the center of the joint.

In April 1936, rapid growth of the epiphyseal remnant became evident objectively by a prominence on the outer side of the elbow, which was also noted in the roentgenograms. A possible malignant change was considered, which prompted a consultation (A. F. V.), with advice being given to refrain from further surgical intervention.

Roentgenographic examination (Figs. 3-A and 3-B), on August 27, 1936, revealed a rapidly developing lateral condyle with no joint deformity. Figure 4, taken on May 6, 1937, and Figure 5 show further organization of the new condyle. Fusion with the shaft might well be expected as in the case of the normal epiphysis.

Regeneration of bone through the stimulation of the epicondylar epiphysis has resulted in preservation of the elbow relations and complete functional recovery, without deformity other than a moderate prominence on the lateral surface of the elbow in full flexion. (See Figures 6-A and 6-B.) The new bone unit has not as yet become fused to the humerus, but no doubt will be in the natural course of events, since at this age it is still an epiphysis. A later plastic operation might be performed for cosmetic purposes if the new condyle becomes too large, but this is doubtful.

Excision of this same bone element in another case was not followed by regeneration; hence there is some anatomical derangement of the elbow, but no functional disability so far after three years.

COMMENT

The excision of an epiphysis is a most unusual procedure and is ordinarily avoided. Discussion relative to the surgical principles involved has been omitted.

The presentation of the case is justified, due to the complete regeneration of the condyle, which is quite contrary to expectation. The retention of the epicondylar epiphysis is vital if regeneration of an excised condyle is to be expected.

ADAMANTINOMA OF THE TIBIA

BY JOHN O. RANKIN, M.D., WHEELING, WEST VIRGINIA

From the Department of Surgery, Wheeling Clinic

Adamantinoma is an epithelial tumor which arises from the enamel organ of the teeth and ordinarily occurs in either the maxilla or the mandible. There have been reported a comparatively large number of cases in this location. Occasional cases of adamantinoma occurring in the region of the pituitary gland have been recorded. One case involving the ovary has been reported by Thoma. In the remaining reported cases the adamantinomata have occurred in the tibia. The case which the author is recording is the eleventh instance of adamantinoma of the tibia reported in the general literature and the sixth to be found in American literature.

According to Holden and Gray, an adamantinoma is primarily a basal-cell tumor, in which all degrees of differentiation of the enamel organ are found. In the less differentiated form, basal cells only are seen. In the more differentiated form, there are branching epithelial strands and groups composed of a peripheral cylindrical layer of cells and a central network of stellate-shaped and transitional cuboidal cells.

The theories of the etiology of tibial adamantinomata are very interesting, but by no means proved at the present time. Reviewing the opinions of the various authors, we find that two theories have been advanced. The first is that from early foetal life there has been a cell-rest in the tibia, which becomes activated in later life to form one of these tumors. The second is that, due to trauma or for some other reason, epithelium is implanted into the periosteum and later develops into adamantinomatous tissue. In the author's opinion, the former theory offers the more logical explanation.

There seems to be no special predisposition with respect to either occupation or sex. The age of the patients varied from twenty-two to forty-six years. The histories of these cases reveal that the symptoms existed for periods ranging from several months to sixteen years. This is very similar to the history of the adamantinoma that occurs in the jaw. In nearly all of the cases there was a history of previous trauma. Of course, one must realize that it is a rare individual who has not had some injury to the shin bone. However, in reviewing the cases, it seems that each patient had an injury of such severity that he had a distinct recollection of its occurrence. As a rule, these patients have a surprisingly small amount of pain after the tumor has developed.

The rarity of adamantinoma makes the diagnosis most difficult. The clinical history and examination do not differentiate it from other growths. Roentgenographically it is almost impossible to differentiate a giant-cell sarcoma, an occasional osteogenic sarcoma, a multilocular

cyst, or a hemangioma from this tumor. Even after the operation has been done and the tumor has been presented to the pathologist, the microscopic diagnosis is extremely difficult. In the following case the pathologist, who is a man of excellent training and wide experience, was unable to make a definite diagnosis. Slides were sent to the Registry of Bone Sarcoma of the American College of Surgeons. These slides were studied and restudied by the members of the Registry before they all finally came to the conclusion that we were dealing with a tibial adamantinoma in this case. It is interesting to note that none of the reported cases was diagnosed until histological examination was made after operation.

CASE REPORT

N. B. (No. 1935 of the Registry of Bone Sarcoma Series), white male, twenty-five years of age, came to the Wheeling Clinic on May 24, 1937, complaining of a painful tumor in the lower part of the left tibia. He gave the history that in 1933, while doing a high jump, he had stabbed his leg at the site of the tumor with one of the spikes of his track shoe. About a year later he had begun to notice some pain and aching in this leg if he was on his feet for any length of time. Soon after this he had noticed some slight swelling at the point of injury. In November 1935, the patient first consulted a physician. A roentgenogram was taken, which revealed a bone tumor. In January 1936, he was operated upon by another surgeon. At this time a curettement was done, and the wound was packed. A biopsy revealed the character of the tumor. The wound healed in a few months, and roentgenotherapy was instituted. In spite of the surgical curettement and the roentgenotherapy, the tumor increased in size. The pain became so severe that the patient could be on his feet for only short periods of time.

Our first examination, sixteen months following the original operation, revealed an apparently healthy young man. The blood pressure, temperature, and blood counts were normal; the Wassermann reaction and urine analysis were negative. There were no pathological findings beyond the lesion on the left tibia, which was located at the proximal end of the lower third. There was rather marked enlargement both laterally and anteriorly. The tumor was tender, but fairly firm. There was no pulsation nor dilatation of veins over the tumor.

Roentgenographic examination revealed an intramedullary, multilocular, expanding tumor without any proliferation or thickening of the periosteum. Surgical removal of the tumor was advised. The patient entered the Ohio Valley General Hospital on June 2, 1937. Two days later, under spinal anaesthesia, the operation was carried out through an anterior incision. It was found that the tumor had broken through the cortex of the bone at several points. Anteriorly it had broken through the periosteum and had invaded the subcutaneous tissues. The growth as it first appeared seemed to involve the muscles surrounding this area, but later, when the tumor was removed, it was found that it stripped readily from the muscle fibers. Anteriorly it was necessary to remove some of the skin in order to do a complete resection. It was obvious that nothing short of resection of the shaft of the bone would be successful. The tibia was then severed about two inches above the ankle joint at the distal end and about three and one-half inches below the knee joint at the proximal end. Because of the extensive involvement at the site of the lesion, it was necessary to remove the periosteum as well as the bone. A second incision was made over the lateral aspect of the fibula at the level of the remaining lower section of the tibia. The fibula was severed at this point, brought through the muscles, and transplanted into the medullary canal of the lower portion of the tibia. The subcutaneous tissues and skin were closed, and a cast was applied. The patient had an uneventful convalescence and was discharged from the Hospital on June 14, 1937.

The patient was seen at regular intervals until October 1937, at which time a roentgenogram revealed that the lower section was well united. He was again admitted to the

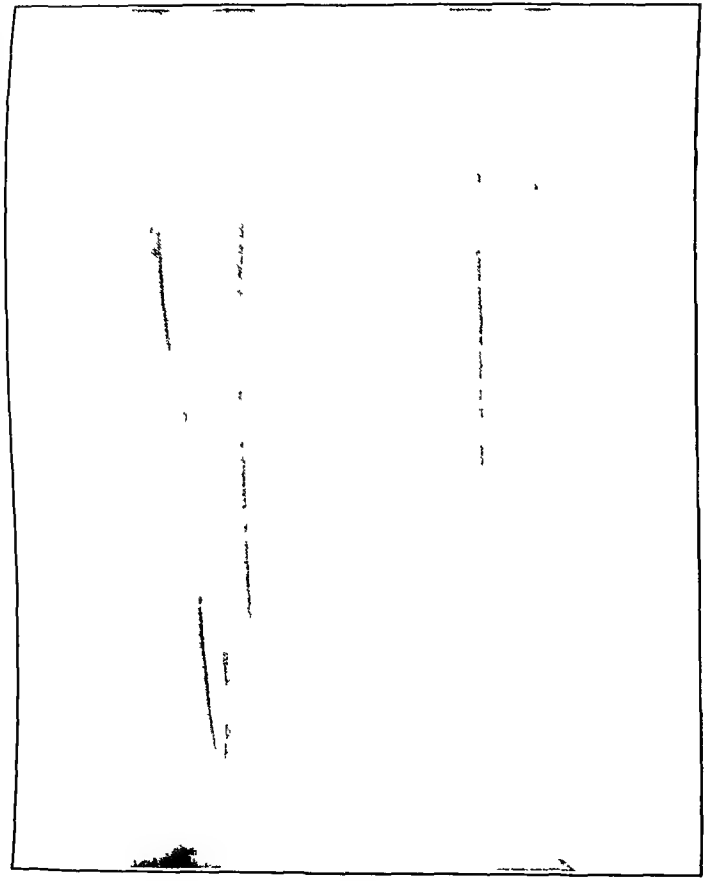

FIG. 1

Roentgenograms, taken in November 1935, before the bone was curetted.

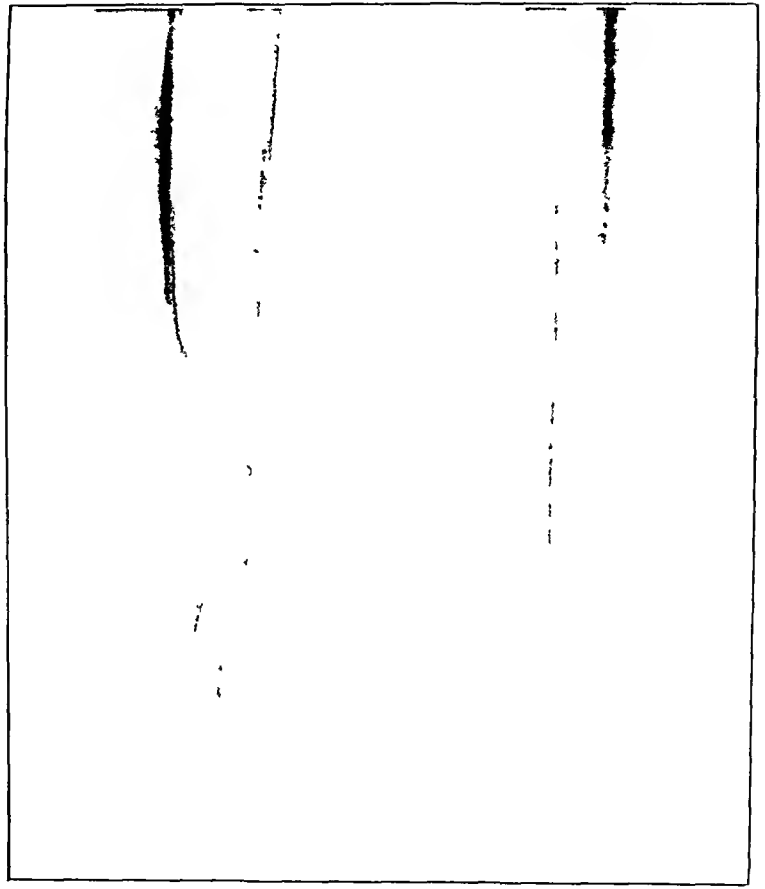

FIG 2

Roentgenograms, taken May 24, 1937, before the tibia was resected.

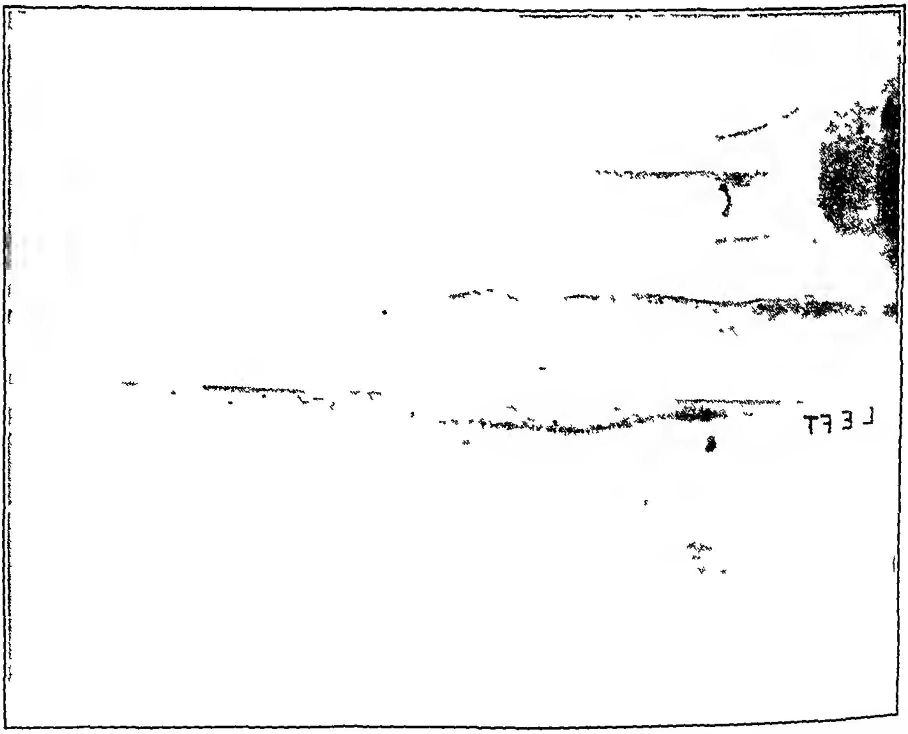

Fig. 3

Anteroposterior views taken after the fibula had been transplanted into the distal end of the tibia. The patient's limb is in a cast.

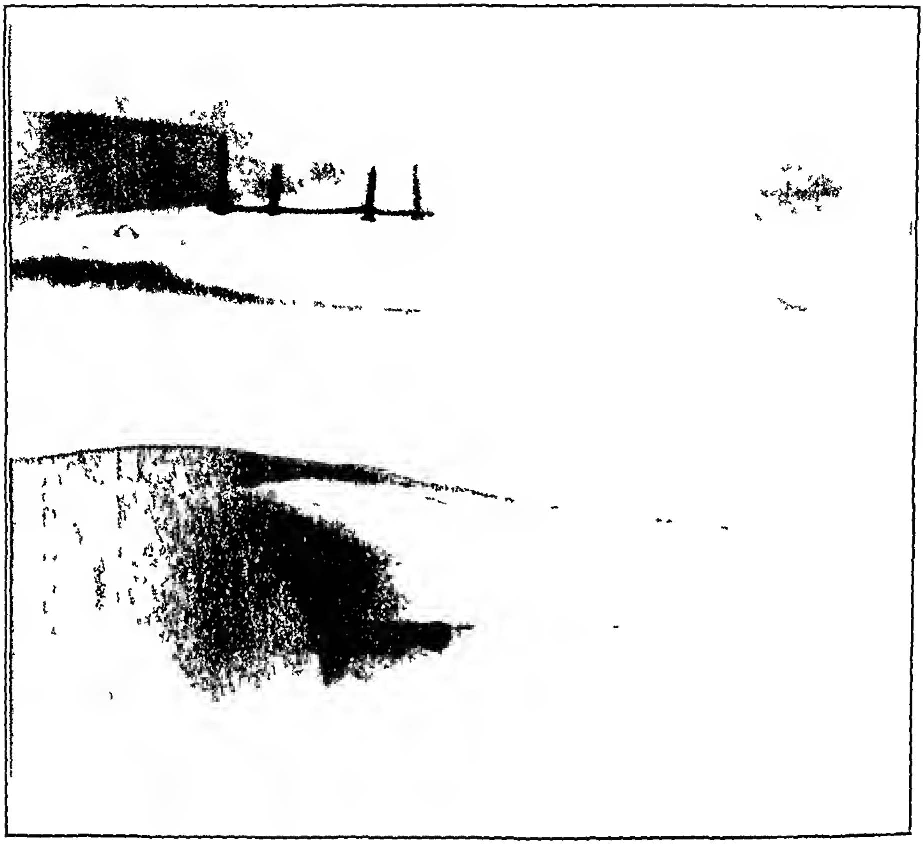

Fig. 4

Anteroposterior and lateral views after the fibula had been transplanted into the proximal end of the tibia. The patient's limb is in a cast.

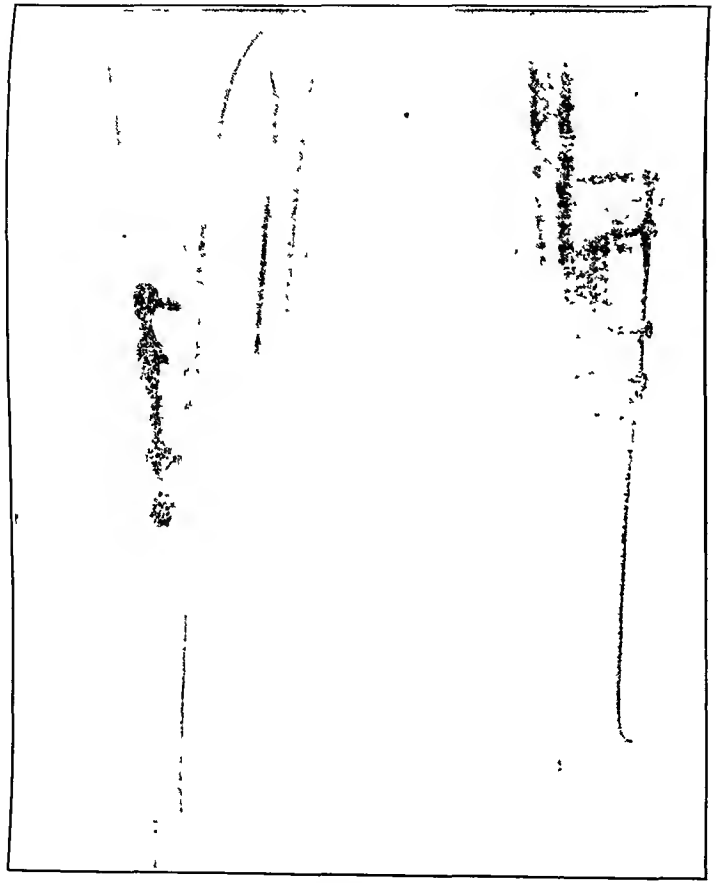

FIG. 5

Anteroposterior and lateral views after both ends of the fibula had united.

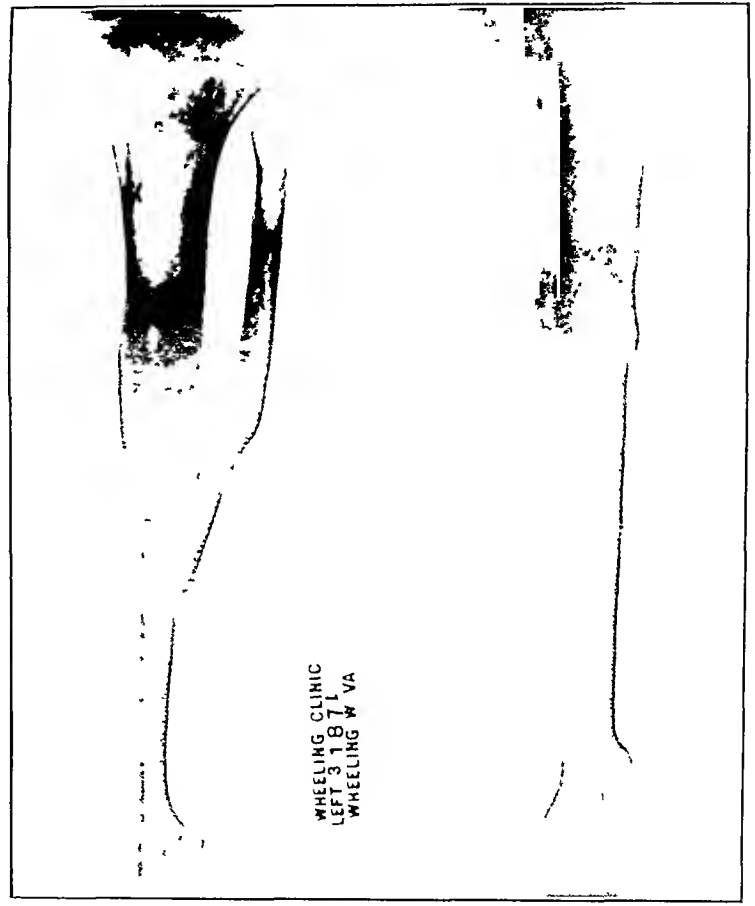

FIG. 6

Anteroposterior and lateral views of the transplanted fibula. The bone plate has been removed. The new shaft of bone can be seen filling into the periosteal bed of the proximal end of the fibula. The fibula is already beginning to enlarge in diameter.

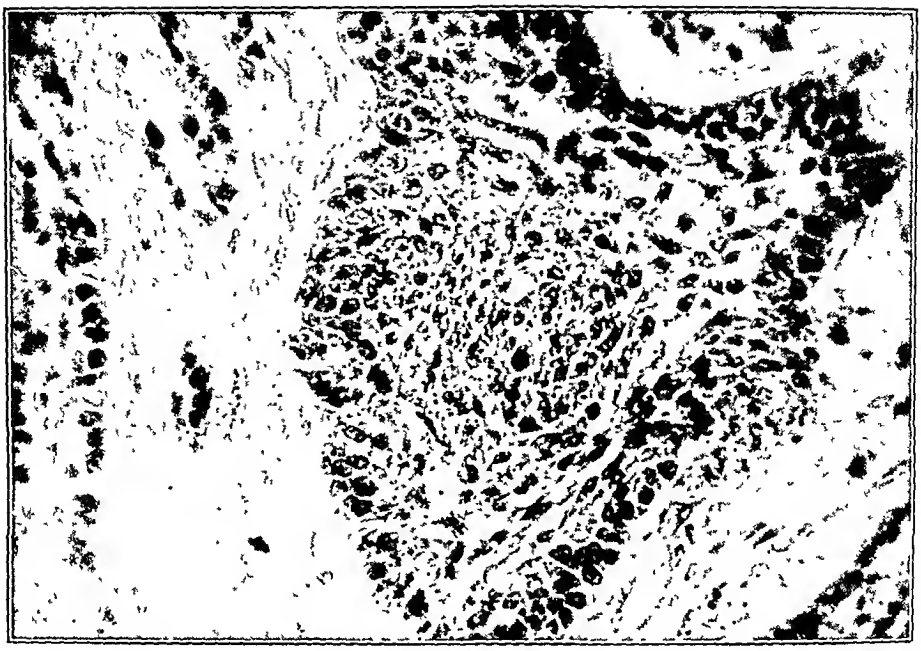

FIG. 7

Photomicrograph of a section of the tumor.

Hospital on October 26, 1937. On October 28, the healed anterior incision was opened, and a lateral incision was made at the upper level of the sectioned tibia. The fibula was severed and transplanted into the upper end of the tibia, but the periosteum was left attached to the proximal end of the fibula. A small portion of the posterior part of the tibia had been broken off at the original section, which necessitated using a plate to retain the fibula. The incisions were closed, and a cast was again applied. The patient had another uneventful convalescence.

At the end of two months roentgenograms revealed that the patient had fairly good union of the fibula with the tibia at the proximal end. A walking cast was applied, and the patient was permitted to walk. In the latter part of March 1938, the cast was removed, and the patient was fitted with a leather brace extending from the foot up to the knee. The brace has been worn since that time. Recent roentgenograms show good bony union at both ends of the fibula as well as a new shaft of bone extending from the point at which the fibula was severed at the proximal end over to the shaft itself, which gives additional support. The patient walks without a cane. He is free from pain. The latest roentgenograms indicate that the fibula has begun to enlarge in diameter. At present there is no evidence of any recurrence.

PATHOLOGICAL REPORT

The pathological report by Dr. H. G. Little of the Ohio Valley General Hospital, Wheeling, was as follows:

"*Gross*: The specimen consists of a piece of bone measuring ten by five and one-half by five centimeters. The bone is from the distal half of the tibia. One surface of the bone presents a rough, granular appearance with apparent erosion and destruction of the cortical bone. On the opposite surface there is a concave area with an opening in the center. This opening leads into a cavity that contains soft, reddish-brown tissue. This material is easily removable. On section of the bone itself there is disclosed a tumor involving the greater part of the shaft. It is irregular in outline and has destroyed much of the bone. The tumor growth is soft, spongy, and vascular. There is no well-defined wall like a cyst. There is marked thickening of the periosteal connective tissue.

"*Microscopic Examination:* The sections from the tumor show a variety of cellular growth. There are large areas of small spindle cells, sometimes in compact growth, then again in a delicate network with small spaces between the cells. These spaces often contain red blood cells or granular material, giving the appearance of an angiomatous type of growth. Here the stroma is not abundant.

"Other areas show a well-developed connective-tissue stroma in which there are islands of cells bordered by a row of cylindrical cells. Sometimes the cells are in thin columns. There are also spaces lined with low and often flattened cells. These spaces contain a fine, granular material and sometimes are filled with a network of the spindle cells.

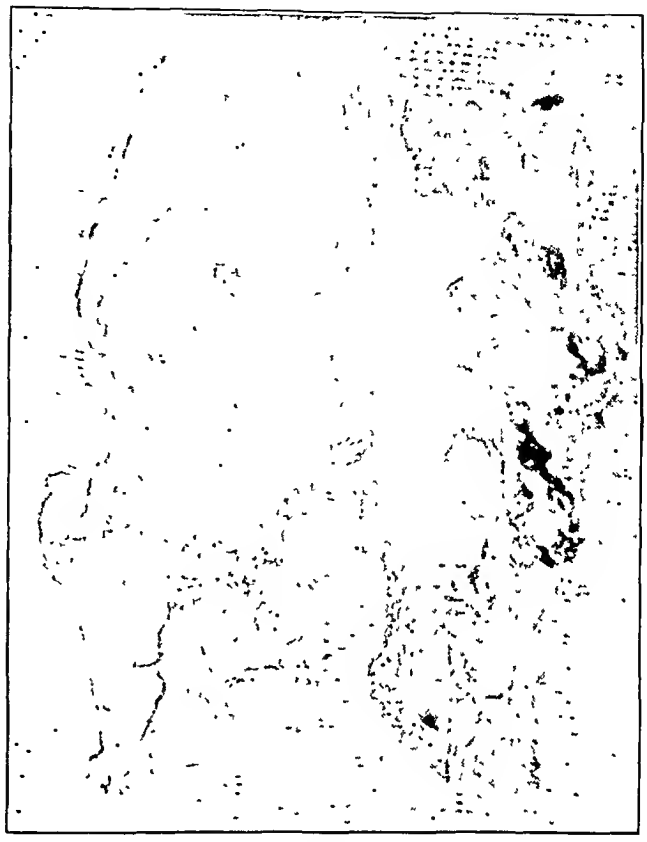

FIG. 8

Photograph of the gross specimen (three-fourths actual size).

"The cells about the borders seem to rest upon a distinct basal membrane. The nuclei of the cells usually show a prominent nucleolus, but mitotic figures are rare. No typical epithelial pearls or squamous epithelial cells are noted. There is also no evidence of bone or cartilage formation. There are occasional multinucleated foreign-body giant cells.

"A differential diagnosis consisted of the possibilities that this tumor was an atypical sarcoma of the bone, adamantinoma, or a tumor of an angiomatous nature. Sections were submitted to the Registry of Bone Sarcoma of the American College of Surgeons for final diagnosis, which was adamantinoma."

SUMMARY

A review of the literature reveals that tibial adamantinoma is a very rare lesion. Only ten cases have been recorded, with one additional adamantinoma-like tumor by Richter. The case reported by the author is the eleventh. Although two theories have been advanced with respect to the etiology of this growth, we do not have sufficient clinical data to substantiate either hypothesis. Clinical and roentgenographic examinations are insufficient for establishing a diagnosis. Even on histological examination the diagnosis is not clear-cut, as is shown in the author's case and in the other reported cases. Adamantinoma is a slow-growing tumor,

which does not metastasize, but recurs unless completely removed. The time of recurrence varies from a few months to several years. The writer believes that, if the growth is not too extensive, it can be removed completely at the first operation by radical saucerization and curettement. If a second operation is necessary, the operation herewith described, which has been used with apparent success in this case, is certainly superior to an amputation.

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MALIGNANT GIANT-CELL TUMOR OF BONE

Report of a Case Involving the Tibia

BY SAMUEL KLEINBERG, M.D., NEW YORK, N. Y.

It has been variously estimated that from 3.5 [4] to 15 [3] per cent. of giant-cell tumors of bone undergo malignant change. Sufficient evidence has now accumulated in the literature to emphasize this unfortunate possibility. Faced with a case in which malignancy has appeared, in what for months or even years was a seemingly benign neoplasm, we are compelled to review recorded knowledge and experience in order to identify the factors which may have a bearing on the transformation.

If a giant-cell tumor is not treated and continues its natural development, as many did several generations ago before the opportunities for treatment were appreciated, it may spontaneously regress and disappear, but in the majority of cases it increases in size and the patient succumbs from hemorrhage or sepsis. In no instance of an untreated case is there a record of the appearance of malignancy or pulmonary metastasis. However, in recent years, few, if any, such tumors go untreated, and many are subjected to vigorous, repeated, and not infrequently often repeated treatments. The supervention of malignancy has been recorded only in such treated cases. It is admitted that the customary conservative methods of radiation or surgery alone or combined are successful in the majority of cases, but we must seek to prevent, if possible, the malignant transformation in the remainder.

DIAGNOSIS

One of our difficulties lies in the uncertainty of diagnosis. A reasonably accurate diagnosis, without biopsy, can be made, based on the history, age of the patient, location of the lesion, and the roentgenographic appearance. These elements suffice in the majority of cases, but, because of the fact that they are variable, a positive diagnosis is not really possible without a biopsy. Dr. William B. Coley,[2] speaking of giant-cell tumors, states: "At the Memorial Hospital it has been found impossible to make a correct diagnosis in 1 out of 4 cases". In the author's own experience he cannot recall a single instance of either a benign or a malignant tumor in which a simple, surgically well-planned biopsy has caused any untoward symptoms, aggravation, or progression of the disease. It is, therefore, his contention that a biopsy ought to be done in every case of suspected giant-cell tumor before any treatment is instituted.

TREATMENT

Primary amputation of a limb for a benign giant-cell tumor is not permissible except under the most unusual circumstances. Excellent

results have been obtained from resections, excision and chemical cauterization, Coley's toxins and roentgen-ray radiation. It is difficult to decide which method should be employed, as each alone and several in combination have yielded splendid results in a large proportion of cases. A *resection* of the tumor area is, of course, the ideal treatment and should be performed whenever possible, as by this method the tumor is removed and a malignant recurrence is precluded. However, in certain locations, as at the knee, this may not be feasible without causing serious damage to the function of the joint. In other locations, as in the vertebrae, complete resection is naturally impossible. When resection is not a tenable procedure the author prefers a thorough *excision* or *curettage* with cauterization with phenol or zinc chloride and filling in of the cavity with an abundance of normal-bone grafts. One may combine with the curettage the postoperative administration of Coley's toxins, since many favorable results have been reported by Dr. William B. Coley.

CASE REPORT

W. B., male, thirty-one years old, was referred to the author on April 1, 1938. His chief complaint was a painful swelling of the left leg near the ankle. The tumor had first been recognized in August 1932. He had previously had some pain in the ankle, which had come on without any definitely known injury. The cause of this pain had been diagnosed as a sprain after a roentgenographic study had been reported as negative. The earliest roentgenograms now available were taken in November 1932 (Figs. 1-A and 1-B). These show an enlargement of the lower three inches of the tibia and complete loss of normal bone structure. The transverse diameter is moderately increased. The cortex is very thin, and normal cancellous bone is absent except in the medial malleolus. There are numerous bone trabeculae traversing the neoplastic area. Posteriorly, about an inch above the articular surface, the cortex is so thin that it appears ready to perforate into the adjacent soft tissue. At the upper extremity of the diseased area there is a sharp demarcation between the neoplasm and the normal bone. At the ankle joint the articular bone seems intact. The diagnosis, made from roentgenograms, was a giant-cell tumor. A surgeon, seeing these roentgenograms, advised excision of the tumor, chemical cauterization of the bone, and the implantation of bone grafts. A roentgenologist of vast experience advised radiation therapy, stating, so it is alleged, that surgery could be used later if necessary. That advice, if given, the author believes is poor advice. The change initiated by radiation therapy in the bone and soft tissues may exclude subsequent application of surgery, as it did in some cases which have come to the writer's notice. For two years this patient had received roentgen-ray radiation and had been told that the tumor was under control, and that the growth of replacement bone had been stimulated by the treatment. The swelling, however, had never disappeared.

Clinically the patient was doing well. The tumor did not increase and was not painful. No adenopathy, no loss of weight, and no metastasis had occurred. The roentgenologist, a physician of outstanding attainments, was satisfied that his treatment was adequate. The patient, encouraged to lead a normal life, indulged liberally in all out-door sports. The family remained concerned, although they never communicated their fears to the patient, because four members of the present and preceding generation had died of cancer.

On April 10, 1937, routine check-up roentgenograms (Figs. 2-A and 2-B) were taken. At this time the patient had no symptoms. It is alleged that these films were interpreted as showing a satisfactory condition and certainly no reason for alarm. Yet as one studies these films and compares them with those made in 1932, although the anteroposterior view appears to show a contraction of the cystic or rarefied area and extensive deposition

of cortical bone, the lateral view shows marked irregularity of the posterior border of the tibia with seeming perforation of the cortex in several places. However, even in the roentgenograms taken in 1937, there is no sign of upward extension of the disease or invasion of the soft tissues.

The roentgenographic appearance is not always reliable. This is supported by the opinion of Dr. Codman, quoted in a recent article by Coley and Higinbotham,[1] who stated: "The films may be characteristic and yet the sections may be unequivocably in favor of some other diagnosis."

Six weeks prior to the patient's first visit to the author on April 1, 1938, he had struck his leg while playing baseball. Since then the region of the tumor had been painful. Examination by the author revealed an enlargement of the lower third of the left leg, involving chiefly the tibia. The area of the tumor was warm and sensitive to pressure. The motions of the ankle joint were normal. There was no adenopathy or clinical evidence of metastasis. Roentgenograms (Figs. 3-A and 3-B), made one week previously, showed a tumor of the lower four inches of the tibia. The bone was enlarged and traversed irregularly by bone trabeculae enclosing areas of marked rarefaction. The cortex was very thin and broken on its posterior aspect. There was no marrow cavity. The

FIG. 1-A FIG. 1-B

November 22, 1932. Giant-cell tumor of tibia.

Fig. 1-A: The lateral view shows marked enlargement of the lower end of the tibia. There is an absence of marrow cavity. The cortex is very thin, especially posteriorly. Irregular bone trabeculae traverse the tumor.

Fig. 1-B: The anteroposterior view exhibits cystic enlargement with disappearance of marrow cavity. Cancellous bone is still present in the medial malleolus. The subchondral articular bone is sclerotic. There is sharp demarcation between the normal and the neoplastic areas.

subchondral bone at the ankle joint seemed sclerotic. There was no apparent invasion of the soft tissue. Compared with previous roentgenograms, the present ones showed a decided extension of the tumor upward into the shaft of the tibia and downward into the medial malleolus. However, even the latest films did not give indubitable evidence of malignancy. The author believed that the patient had a giant-cell tumor, but advised a biopsy, warning the family that in a small percentage of the cases the tumor proves to be malignant. A roentgenogram of the lungs was negative. Physical examination, including laboratory tests on the urine and blood, revealed nothing abnormal.

A biopsy was performed under an Esmarch bandage on the thigh. The periosteum was inordinately adherent to the bone. On elevating the periosteum the author exposed an area of tibia, about one and one-half inches square, in which the surface bone was very irregular. The cortex on the medial surface of the tibia was removed, exposing a large cavity, about four by three inches, filled with dark-red fluid and lined with a thick, dark-red, deeply congested membrane, which was readily removed. There was no marrow cavity, and no cancellous bone was present. The cortex was very thin and posteriorly had perforated into the soft tissue. Above this cavity the tibia was highly sclerotic for about an inch; beyond and above this there was a second cavity in the tibia, about one and one-half inches in the vertical diameter, filled with semisolid grayish granulation tissue, which had replaced the cancellous and medullary tissue.

FIG. 2-A

FIG. 2-B

April 10, 1937. Giant-cell tumor of tibia.

Fig. 2-A: The lateral view shows much new-bone formation, but there are several areas on the posterior wall of the tibia in which perforation is imminent or has occurred.

Fig. 2-B: The anteroposterior view shows increased density of bone in the tumor with apparent reduction in the cystic area.

Dr. Henry L. Jaffe, pathologist at the Hospital for Joint Diseases, rendered the following report on the biopsy specimen.

"*Gross:* Specimen consists of a number of pieces of soft and osseous tissue. Essentially the former consists of a thin-walled fibrous membrane (which, opened, measured roughly eight by six centimeters, and three to four millimeters in thickness) and a more solid mass of tissue, one surface of which is hemorrhagically discolored and covered by fibrinous material. The afore-mentioned membrane is composed essentially of fibrous tissue, presents yellow flecks of lipoid in its wall, and in places shows nodules of soft whitish cellular tissue. The other mass of soft tissue noted above is composed of irregular masses of whitish-yellow cellular tissue attached to the more dark-brownish hemorrhagically discolored tissue. Nowhere is there a resemblance of the soft tissues to that of a genuine giant-cell tumor of bone.

"The various fragments of bone are also of two types. One consists of several flat pieces of thinned cortical bone, whose inner surface in many places is pitted and contains whitish tumor tissue. The other osseous mass is a large irregular piece of bone, one end of which has been eroded on the medullary side. The other side presents a fairly thick cortex.

FIG. 3-A

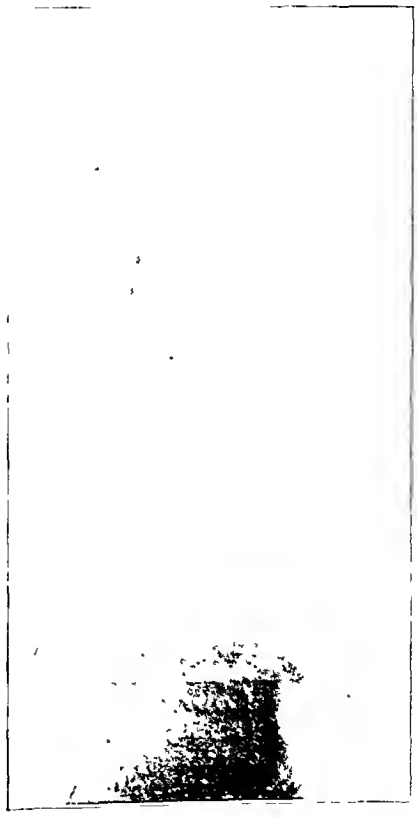

FIG. 3-B

March 24, 1938. The anteroposterior diameter of the tumor area is greatly increased, with perforation posteriorly into the soft tissue.

Fig. 3-A: In the lateral view one observes marked upward extension of the disease.

Fig. 3-B: The anteroposterior view shows the marked upward extension of the disease beyond the sclerotic area. The tumor has invaded the medial malleolus. Destruction and absorption of the bone trabeculae, noted in 1932 and 1937, are evident, as well as increase in the cystic involvement.

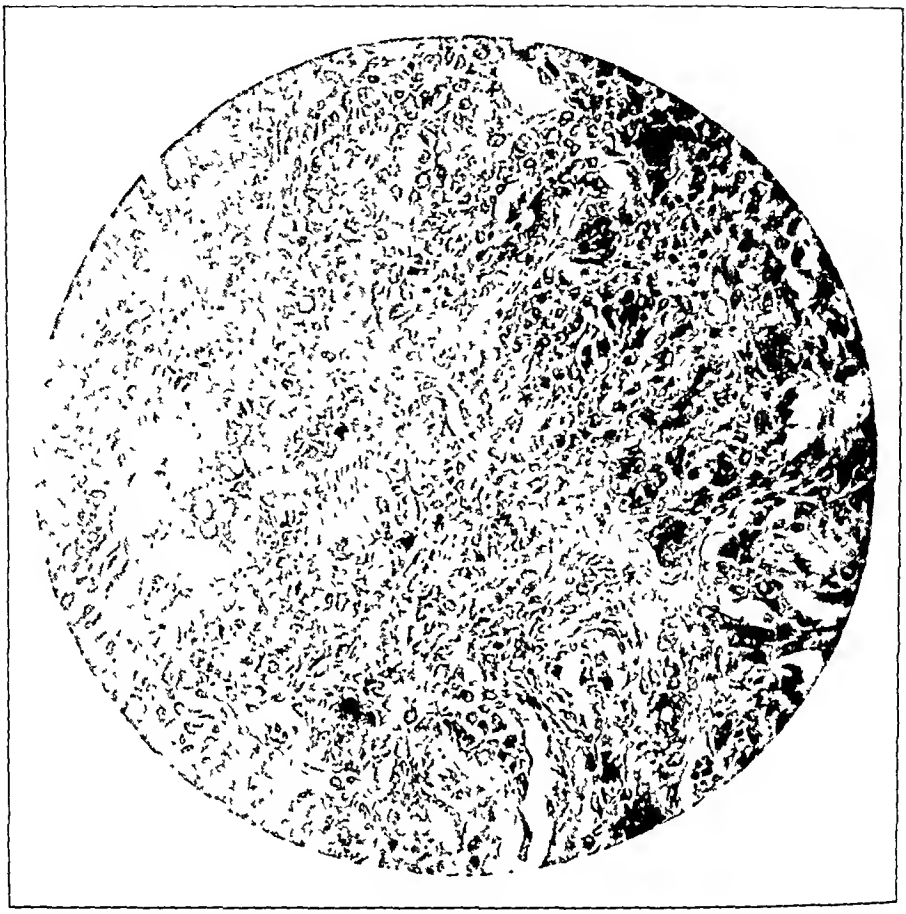

FIG. 4

April 1938. Photomicrograph (× 80) of malignant giant-cell tumor of tibia. Complete replacement of bone by tumor tissue. Tumor very cellular. There are many irregularly shaped giant cells with comparatively few nuclei.

"*Microscopic* [Figs. 4 and 5]: Sections of both the membranous and the more solid parts of the lesion show that where tumor is present the basic architectural pattern is analagous to that of the benign giant-cell tumor. That is, the lesion is highly vascular, shows numerous giant cells (typical foreign-body-like giant cells) in relation to the vascular endothelium, and considerable intervascular stroma. However, the point of departure between this tumor and the typical benign giant-cell tumor is in the character of the stromal cells. The latter do not tend to be spindle-shaped; they are round to polyhedral in form; they are of various sizes, many being quite large; many are seen in mitotic division. Their nuclei are bizarre in respect to size, shape, and staining quality; many contain nucleoli; some of these cells have two to four nuclei and are evidently tumor giant cells; in places between the cells there is a small amount of pink-staining amorphous material.

"Sections of the bone fragments show extensive aseptic necrosis (radiation) with moderate periosteal new-bone formation. In the more attenuated portions of the specimen, one observes tumor tissue abutting against the bone and extending through enlarged vessel spaces, and even, in a few places, extending to the periosteum. The morphology of the tumor tissue is essentially as previously described. Nowhere does the tumor show any new-bone formation. The presence of intercellular material within the cellular tumor tissue, staining pink with eosin, is more conspicuous here than in the soft-tissue sections. In places the tumor tissue is very vascular.

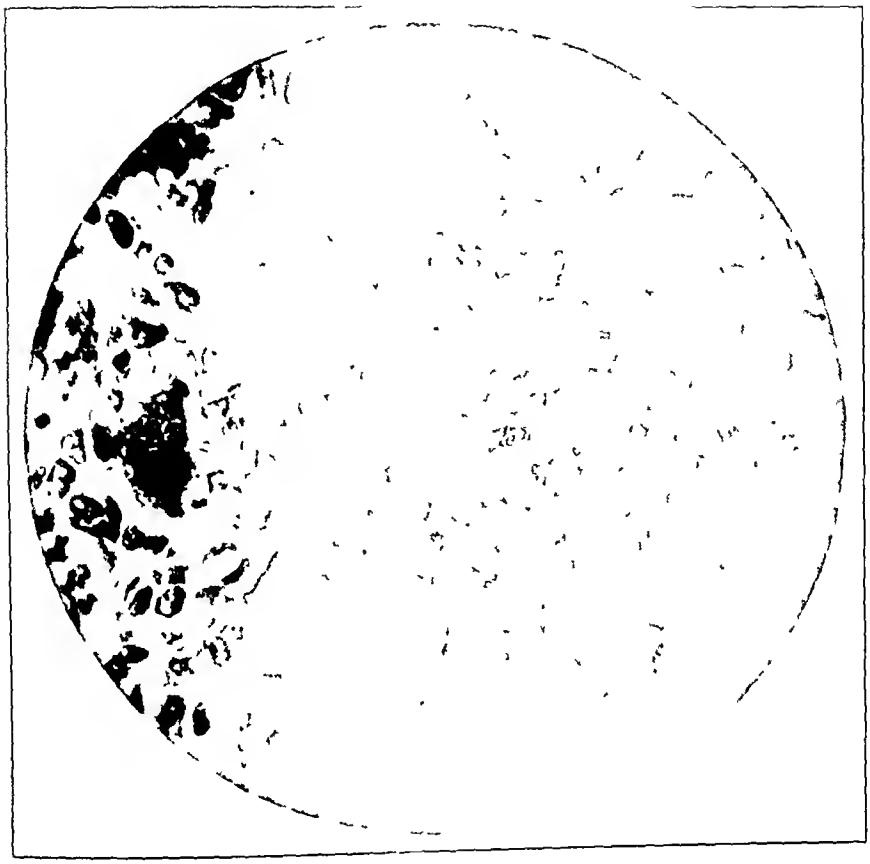

FIG 5

Photomicrograph (× 187) of malignant giant-cell tumor. The giant cells contain few nuclei. The stromal cells are round to polyhedral, varying in size, many being quite large There are many cells in mitotic division. The nuclei are irregular in size, shape, and staining quality, many contain nucleoli.

"*Diagnosis:* Malignant giant-cell tumor of the tibia"

Since the pathological examination indicated beyond any doubt a malignant transformation of the giant-cell tumor, an amputation of the leg was performed three days later, on April 4, 1938 After the patient left the hospital he was referred to Dr. Milton Friedman, who administered roentgenotherapy to the chest The patient has returned to business and feels well A recent roentgenographic check-up of his lungs (Fig 6) shows, however, that there are numerous metastatic foci Presumably this patient is doomed as others with a similar history have been in the past

SUMMARY

From the history of the comparatively long course of the illness in this case and from the roentgenographic findings, we may assume that the lesion was originally a benign giant-cell tumor. It is difficult even to speculate when malignancy set in. Although there is a history of injury subsequent to which the patient became acutely aware of the tibial lesion, yet for months previously he had frequently felt a twinge of pain in the leg. As this patient indulged in many athletic sports, perhaps he had

injured the leg on many occasions and in that manner had stimulated the malignant change. It may be permissible to believe that the lesion may have had a low grade of malignancy originally, which was further attenuated but not entirely destroyed by the intensive radiation, and that subsequent minor traumata excited a full development of malignancy. Appreciating that many giant-cell tumors of bone have been cured by radiation, nevertheless the author cannot but feel that a more satisfactory procedure in this case, which was readily accessible to surgery, would have been thorough removal of the tumor tissue, supplemented by cauterization of the wound, as advised by the surgeon originally consulted six years ago Knowing as we do now, through the abundant evidence recorded in the literature, that a giant-cell tumor of bone may become malignant and prove fatal, the author is convinced that when a giant-cell tumor can be treated surgically it should be completely excised at the earliest opportunity. Furthermore, in order that there shall be no doubt about the diagnosis, which cannot be certain from roentgenographic evidence alone, a biopsy ought to be performed in every accessible lesion which may be a giant-cell tumor.

FIG. 6

November 19, 1938. Roentgenogram of lungs, showing extensive metastasis

CONCLUSIONS

1. An immediate biopsy should be performed in every accessible giant-cell tumor to establish an accurate diagnosis.

2. A giant-cell tumor in a long bone should be treated by early and thorough excision of the entire lesion.

3. Roentgen-ray radiation should be reserved for giant-cell tumors of inaccessible bones.

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EPIPHYSIODESIS COMBINED WITH AMPUTATION

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The author has been impressed with the frequent necessity for reamputation in children. The major cause for this has been growth of the bones without accompanying growth or elongation of the soft parts. This results in tight, painful soft parts stretched over the end of the bone. In some cases there has been protrusion of the bone through the tightly stretched skin.

Past experience has taught us that certain stump lengths may be considered as ideal. This is particularly true in the case of the tibia. The prosthesis makers also warn us that certain specified lengths are desirable. For instance, approximately a seven-inch tibial stump is found to be much more suitable for the application of an efficient prosthesis than any other length of the tibia.

This report is concerned with amputations in children who are old enough so that an "ideal" length can be obtained. This is usually possible in children over the age of six. We presuppose that the remaining epiphysis of the severed bone is still open. This should be determined by roentgenographic examination, as the upper tibial epiphysis, for example, not infrequently remains open until the age of twenty-four or twenty-five.[1]

The arrest of bone growth by epiphyseal fusion[2] is now widely used. As far as the author knows, it has not been done on amputation stumps. Epiphysiodesis is, therefore, suggested as an adjunct to amputation in children. Neglect of this procedure frequently means further bone growth and reamputation. Following primary amputation, it is probably better to wait until the wound is healed before doing the epiphyseal arrest, but in reamputations both procedures have been done at one time.

The following procedure is now being routinely used at the Crippled Children's Hospital:

TECHNIQUE OF OPERATION

A two-inch incision is made over each side of the epiphyseal plate except on the lateral aspect of the tibia; here it is curved laterally, so that both tibia and fibula can be operated upon through one skin incision but two fascial incisions. The bone is exposed subperiosteally up to the epiphysis. A block of bone, one inch long and one-half an inch wide, is removed; the epiphyseal plate is curetted; and cartilage, covering an area about the size of a quarter, is removed. The epiphyseal plate is then cauterized with an electrocautery to destroy the remaining cartilage cells. The author feels that use of cautery hastens fusion and is an extra precau-

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tion in destroying the cartilage plate. A small hole is then gouged into the epiphysis, and the bone graft is driven across the epiphyseal line. A dry dressing is applied without splinting, but no weight-bearing is allowed for at least a month.

REPORT OF A TYPICAL CASE

M. R., male, aged fourteen years, had had his right ankle run over by a train in 1933. Amputation had been performed on the same day, leaving a seven-inch stump. Convalescence was uneventful and he had walked well with an artificial leg until one year ago. Progressively increasing pain in the stump had then developed, and he was finally almost unable to walk.

He was readmitted to the Hospital in June 1938, and examination showed that the skin was tightly stretched over the right tibial stump, the end of which was very tender. The stump measured nine and one-half inches and the extremity twenty-six inches; and the left extremity, twenty-nine and three-fourths inches in length. Roentgenograms showed only skin over the bone and, in addition, wide-open epiphyses. A reamputation was performed on June 13, 1938, leaving a seven-inch tibial stump and a five-inch fibular stump. At the same time, an epiphysiodesis of the upper tibial and fibular epiphyses was done. Convalescence was uneventful. The postoperative stump measurement was seven and one-half inches; the right leg was twenty-four and one-eighth inches long and the left leg, twenty-nine and three-fourths inches. The patient was discharged on crutches, and a prosthesis was fitted and applied three months later.

Examination in January 1939 showed that the patient was walking well without pain. The scar was not adherent. Roentgenograms revealed obliteration of the epiphysis. The stump measurement was seven and one-half inches; the right leg was twenty-four and one-half inches long and the left leg, thirty and three-fourths inches. Although both legs had grown, the stump had remained the same length.

Five patients between the ages of nine and thirteen have been operated upon to date, and all show epiphyseal fusion.

SUMMARY

Epiphyseal fusion is recommended to prevent deformity and reamputation in children.

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THE CALCIUM AND PHOSPHORUS METABOLISM IN OSSIFYING FIBROMA OF THE MANDIBLE*

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Reports of studies on the calcium and phosphorus metabolism of patients with ossifying fibroma of the mandible could not be found on extensive search of the literature. The absence of involvement of the rest of the skeleton and also the histopathology of this tumor do not suggest a disturbance in the normal bone metabolism. In a recent detailed report of thirteen cases of fibrous osteoma of the jaw, Phemister and Grimson determined the serum calcium and phosphorus in four cases and found them to be within the limits of normal. Since this finding does not necessarily preclude a disturbance in the calcium and phosphorus metabolism, complete balance metabolism studies of these two elements were made in a case presenting the typical clinical and laboratory findings of this disease.

FIG. 1

Roentgenogram of the right jaw, showing multilocular cyst and expansion of cortex.

CASE REPORT

D. B. (No. 376342), a white woman, twenty-seven years old, married, was admitted to the University Hospital on November 1, 1937. At the age of twenty-two years, she had first noticed a slowly increasing swelling of the right lower jaw. There was no associated pain or tenderness. A biopsy was done two years later, following which the swelling increased rather rapidly in size. The patient was admitted to the service of Dr. D. P. Snyder on February 10, 1936. The roentgenogram showed a cystic multilocular lesion in the right mandible. The tumor was excised, and the wound was treated with electrocoagulation. From the tissue removed

* This investigation was aided by a grant from Mr. William Wallace Kincaid, Ellerslie-on-Niagara, Youngstown, New York.

FIG. 2

Photomicrograph (low magnification) of central fibrous and peripheral calcified and ossified portions.

the diagnosis of ossifying fibroma of the jaw was made by Dr. H. L. Reinhart. There was no subsequent change in the size of the swelling until six months prior to the present admission, when the patient noticed a more rapid growth of the tumor. There was no associated history of trauma or of infection of the jaw.

The physical examination revealed no abnormalities except those in the right lower jaw. There was a fusiform swelling of the mandible beginning at the second incisor and extending to the angle of the mandible. The molars were absent on the right lower side. There was a marked asymmetry of the face, due to the prominence of the right cheek and jaw.

The laboratory examination revealed a hemoglobin of 13.9 grams (Newcomer) with an erythrocyte count of 4,320,000. The total white cell count was 7,000 with a normal differential. The urine was negative. The Wassermann and Kahn reactions of the serum were negative. The serum calcium was 10.2 milligrams per 100 cubic centimeters, and the inorganic phosphorus was 4.3 milligrams per 100 cubic centimeters. The serum phosphatase activity was 8.0 King units. The blood urea nitrogen was 18 milligrams per 100 cubic centimeters, and the renal function was normal by the phenolsulphonphthalein excretion test. The basal metabolic rate on admission was minus 5, with the temperature at 99 degrees Fahrenheit and the pulse at 74 in the basal state. Roentgenographic examination (Fig. 1) showed expansion of the cortex of the right mandible,

FIG. 3

Photomicrograph (low magnification) of the periphery of the fibroma, showing bone marrow and normal cancellous bone.

beginning at the second incisor and extending to the angle of the mandible. There were several cystic areas, without evidence of sclerosis or new bone formation.

The operation was performed by Dr. D. P. Snyder. An incision was made over the tumor, and the cortical bone was removed. The cancellous bony tissue and tumor were excised by curettement, and the bleeding was controlled by electrocoagulation. A radium plaque was inserted in the remaining cavity seventeen days after the operation, and the patient was given 100 milligram hours of radiation. During the next three months several small sequestrae were removed from the cavity, which was rather slow in closing. There is no evidence nine months after operation of recurrence of the tumor.

The microscopic sections showed the tumor to be composed of a dense fibrous-tissue center with calcification and ossification of the peripheral portion (Fig. 2). There was no capsule, and the periphery blended with the fibrous and myxomatous bone marrow. The surrounding bone was normal and presented the usual endosteal osteoblastic membrane (Fig. 3). There was no invasion of bone. No osteoclasts or giant cells were observed in any of the sections. There was no cellular infiltration suggesting old or recent inflammatory reaction. The central portion of the tumor was avascular, while the peripheral zone showed numerous large blood vessels.

The tumor was essentially a fibroma. It was composed of a dense collagenous fibrous-tissue center (Fig. 4). The fibroblasts contained large, spindle-shaped, dark-

FIG. 4

Photomicrograph (medium magnification) of fibroma, showing fibroblasts, degenerated fibrocytes, and calcification.

staining nuclei. There were no mitotic figures. Toward the periphery of the tumor there were numerous islands of degenerated fibrocytes, as shown by the absence of nuclei. These areas were surrounded by a ring of deep-blue-staining amorphous material. Several of these degenerated areas showed osteoid formation. The new bone formed was irregular, and there was no lamination.

METHODS

The balance studies were conducted according to the procedure reported by Puppel and Curtis in a previous publication from this Clinic. Five days prior to the commencement of actual balance determination, the patient was placed on a low calcium and phosphorus diet, while the water intake was maintained at a level of 1000 cubic centimeters per day. The balance was determined over a total period of nine days. The serum-calcium determinations were made after the method of Clark and Collip; the phosphorus and serum phosphatase, by the method of King. The total-calcium content of the food, faeces, and urine was determined

by the method of Puppel and Curtis. The analyses were all made in duplicate.

RESULTS

The results of the balance studies are presented in Table I. On a relatively low calcium intake of 0.928 grams per three-day period, the average negative balance was minus 0.192 grams per period. This is normal for a patient of this age group maintained on a low calcium intake. The serum calcium was low, but within the limits of normal. It averaged 8.7 milligrams per 100 cubic centimeters for three determinations.

The phosphorus intake was 1.480 grams per three-day period. The balance was also negative,—minus 0.117 grams per three-day period. This is also normal. The serum inorganic phosphorus ranged between 4.9 and 3.0 milligrams per 100 cubic centimeters, which is normal. The phosphatase activity was normal on four successive determinations. It ranged between 6.5 and 8.0 King units.

DISCUSSION

Both Montgomery and Phemister point out that there is no generalized involvement of the skeleton in ossifying fibroma of the jaw. No other bone cysts were found in those patients who had complete roentgenographic examinations of their skeletons. In the case described the remainder of the skeleton was normal, while there was no evidence of osteoporosis or of cyst formation. The roentgenographic appearance of this condition is characteristic. It is limited to the jaw. The lesion is multilocular, and the edges of the cyst are smooth and even. There is expansion of the cortex of the mandible.

The histopathology of this tumor is readily differentiated from the other more common cysts of bone. There is complete absence of the increased bone activity seen in von Recklinghausen's disease and particularly in Paget's disease. There are no mosaic patterns as found in the latter condition. The giant-cell tumors found in young individuals present a characteristic picture, which may be readily recognized.

In ossifying fibroma of the mandible the fundamental picture is that of a neoplasm, as was brought out by Phemister and Grimson. The fundamental cell is the fibroblast in different stages of development. Toward the periphery there is a ring of adult fibrocytes undergoing apparent degeneration as evidenced by the disappearance of the nuclei. There are islands of calcification with dense-staining peripheral portions. In the larger areas of calcification there is invasion of the devitalized tissue by osteoid cells, and new bone appears. The periphery of the tumor shows fibrotic and myxomatous marrow, with normal adjoining bone. Where the tumor approaches the bone directly there is no increased osteoblastic activity, and the fibrous tissue does not invade the adjacent bone.

The normal calcium and phosphorus balance in this case supports the view that ossifying fibroma of the jaw does not belong to the group of osteodystrophies produced by a faulty mineral metabolism.

TABLE I

CALCIUM AND PHOSPHORUS BALANCE STUDIES
DIET, 2110 CALORIES; PROTEIN, 48 GRAMS

Period	Date When Started	Calcium				
		Output			Intake	
		Urine (*grams*)	Faeces (*grams*)	Total (*grams*)	Food (*grams*)	Balance (*grams*)
I	Nov. 9, 1937	0.213	0 680	0 893	0 889	−0 004
II	Nov. 12, 1937	0 368	0 941	1 309	0 919	−0.390
III	Nov. 15, 1937	0 412	0 748	1 160	0 978	−0.182
Three-day average		0 331	0 789	1 120	0 928	−0.192

Period	Date When Started	Phosphorus				
		Output			Intake	
		Urine (*grams*)	Faeces (*grams*)	Total (*grams*)	Food (*grams*)	Balance (*grams*)
I	Nov. 9, 1937	0 666	0.791	1 457	1.452	−0.005
II	Nov. 12, 1937	0 824	0.774	1 598	1.467	−0.131
III	Nov. 15, 1937	1 093	0 643	1 736	1.521	−0.215
Three-day average		0 861	0 736	1 597	1.480	−0.117

Period	Date	Calcium and Phosphorus Values in Blood Serum		
		Calcium	Phosphorus	Phosphatase Units
		Milligrams per 100 cc.		
I	Nov. 9, 1937	8 4	4.9	6.7
II	Nov. 12, 1937	8.5	4.3	7.0
III	Nov. 15, 1937	9 3	3.0	6.5
Average		8 7	4.1	6.7

Early recognition of this type of tumor is important. There are no reports of malignant changes in this fibroma. Incomplete removal or inadequate treatment allows considerable expansion of the mandible, which results in disfiguring asymmetry of the face. This cannot be cor-

rected once the tumor has reached large size except by radical resection of the mandible. This is difficult and is associated with danger of infection. Furthermore, cosmetic results from such operations are not entirely satisfactory.

The treatment advocated by Phemister and Grimson is as complete excision as possible without resection of the mandible. This should be followed by irradiation, preferably roentgen-ray. Radium produces considerable destruction of the surrounding bone, as was observed in our case.

SUMMARY

In the case of ossifying fibroma of the mandible reported, the calcium and phosphorus metabolism was found to be normal. There was no increase in the phosphatase activity of the serum.

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AN OPERATION TO IMPROVE ABDUCTION POWER OF THE SHOULDER IN POLIOMYELITIS *

BY ALVIA BROCKWAY, M.D., LOS ANGELES, CALIFORNIA

From the Clinics of the Orthopaedic Hospital, Los Angeles

In poliomyelitis of the upper extremity the deltoid muscle is frequently affected, and this weakness is often associated with a varying degree of paralysis of the muscles of the scapular group.

This paper is primarily concerned with deltoid and supraspinatus paralysis associated with weakness of the rhomboid muscles. Given this combination, the problem of bracing to protect these weak muscles becomes more difficult. In order to protect the weak deltoid or supraspinatus muscles, it is necessary to maintain the shoulder in an attitude of abduction by means of bracing for many months. In this attitude, the weak rhomboids are put on a continual stretch, which adds still further to the weakness of this group of muscles.

In a study made by Dr. Robert Carroll of Los Angeles, it was demonstrated that the normal shoulder in an attitude of 90 degrees brings the scapula into a position of rotation of about 30 degrees. Most textbooks describe a neutral position of the scapula with the shoulder at a right angle to the body. However, when there is the combination of paralysis just defined, the scapulae are usually found to be abducted much more than 30 degrees when the arms are placed at right angles to the body. This means that an apparent abduction of 90 degrees at the shoulder may actually mean only 50 or 70 degrees, if the angle is measured between the humerus and the scapula.

There is no brace that will effectively maintain the scapulae in an adducted position while the shoulders are in an attitude of abduction. Consequently, the deltoid is protected, but only partially so, at the expense of the rhomboid muscles.

The rhomboids are important stabilizers of the scapulae. Weakness of these muscles, which permits undue rotation of the scapulae, indirectly lessens the abduction power of the shoulder, because the anchorage point against which the pulley action of the deltoid works is insecure.

In other words, there are two factors which may decrease the lifting power of any lever. The first is weakness of the lifting arm itself, which in the condition here considered is the partially paralyzed deltoid muscle. The second is weakness or instability of the fulcrum against which the lever arm works,—in this case, the weak rhomboid muscles. Attempts to improve this lifting power may be directed toward either or both of the conditions which may be contributing to this disturbance of function.

In the past, all operations, except arthrodesis of the shoulder, have

* Read at the Meeting of the Western Orthopaedic Society, San Francisco, California, October 21, 1938.

been directed toward improvement of the first factor,—that is, increasing the strength of the lever arm by means of muscle transplants, such as the trapezius or the short head of the biceps and the long head of the triceps, into the acromion process. These operations have given excellent results in cases in which strong muscles have been available for transplantation. Sometimes, however, the transplanted muscles are also partially paralyzed and the strength they have given to abduction of the shoulder has not been quite enough. Additional help would be welcomed if it were available.

Apparently little thought has been given to the importance of the rhomboid muscles in fixing the scapulae and the part this plays in improving abduction of the shoulder. Dr. C. L. Lowman at the Los Angeles Orthopaedic Hospital called attention to this observation, and in 1936 did the first operation for weak rhomboid muscles associated with partial deltoid paralysis. Since then ten patients have been operated upon.

The operation consists of tying the scapulae together with fascia lata. Short incisions are made over both scapulae along the vertebral borders and at the level of the spines. A subperiosteal dissection is done. One end of the strip of fascia lata, which is about three-quarters of an inch wide, is passed through a hole gouged through one scapula one inch lateral to the border and just below the spine. The fascia is sutured back on itself with silk, and the other end is passed subcutaneously to the opposite scapula and sutured in the same fashion. There should be sufficient tension so that the vertebral borders of the scapulae are almost parallel to each other. This anchorage point is chosen because roentgenographic studies indicate that this point is the center of rotation of the scapulae. Thus, the tying together of the two scapulae does not restrict rotation.

The shoulders should be examined before surgery to determine if any adduction contracture is present. If such a contracture is present in any marked degree, the contracted structures should be thoroughly stretched, either before or at the time of surgery.

Following surgery, the arm should be immobilized at the side of the body, or at least in an attitude of abduction not exceeding 40 degrees, for from three to four weeks. In three of our earlier cases the strip of fascia pulled loose,—twice it gave way at one of the suture lines and once it cut through the bone. It is important to anchor the transplant thoroughly with silk, and, if the bone of the scapula is thin and friable, the hole should be made through the medial border of the spine where the bone is thicker.

After four weeks, the arm is again placed in a brace in the desired position of abduction, usually at a right angle. This wide abduction in a brace is necessary for a long time in order to protect the deltoid against gravity pull. At this time also, muscle reeducation and pool treatments can be started again. The brace is removed during treatment.

It has been our repeated observation that, given the combination of muscle weakness described—loss of power of the abductor muscles of the shoulder, together with rhomboid insufficiency—adduction contractures

occur within a few months, even though the shoulder has been maintained continuously in abduction from the onset of the disease.

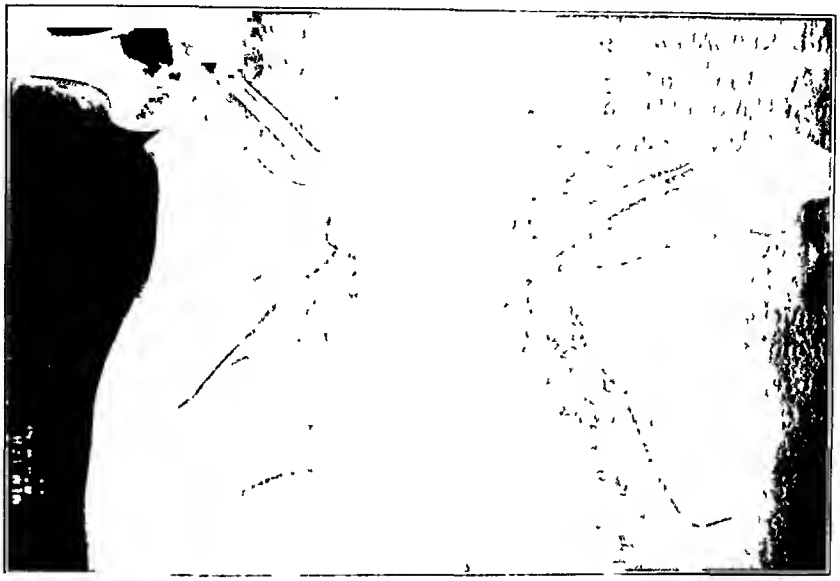

FIG. 1

Bilateral partial paralysis of the deltoid and rhomboid muscles following poliomyelitis. The shoulders have been braced at right angles to protect the weak deltoids. Because of this, the scapulae have become widely abducted, which has added a stretch paralysis of the already weak rhomboid muscles. Furthermore, the deltoids have no firm foundation against which to act.

FIG. 2

Showing the same paralysis as in Fig. 1. The scapulae have been tied together with fascia lata. Adduction contractures have been prevented, and the weak deltoid muscles have a secure point of fixation; thus, the potential abduction power of the shoulders is made available.

On several occasions in which the shoulder had been maintained in an attitude of 75 or 90 degrees of abduction it was discovered several months later that the degree of abduction as measured between the scapula and the humerus was half or less than the amount of apparent abduction. It is important, then, not to be misled by the apparent abduction as measured between the humerus and the side of the body.

For this reason, in cases of poliomyelitis, this operation is one of the few reconstruction procedures which should be done rather early, at least as soon as it is demonstrated that there is moderate paralysis of the rhomboids and of the abductor muscles of the shoulder. There is no point in waiting, because, with this combination of muscle weakness, bracing or splinting is impractical and misleading. As adduction contracture occurs, the rhomboid muscles are further weakened by stretch paralysis. Furthermore, the deltoid muscle is not adequately protected, because an apparent 90-degree shoulder abduction may be only 60 degrees or even less.

Therefore, this operation done early serves a twofold function. First, it permits the humerus to be maintained at any degree of abduction desired while the scapulae are held in an attitude of adduction. Thus both muscles are at the same time maintained in a favorable position of rest, so that return of muscle power is aided. In the same manner, adduction contracture of the shoulder is prevented. Second, abduction power of the shoulder is improved because there is more adequate fixation of the scapulae. A point of fixation has been provided against which the weakened deltoid and supraspinatus may more effectively act.

The author does not wish to imply that this operation is meant to replace the other tendon transplantations for deltoid weakness. It merely makes possible the full use of the potential abduction power present in the shoulder.

It is a simple operation, and, in cases of relatively mild abduction paralysis, it may be the only operation required. In one such case a recommendation had first been made to transplant the short head of the biceps and the long head of the triceps into the acromion. It was then decided to do the fascial transplantation between the scapulae first, as there was a considerable degree of weakness of the rhomboid muscles. This was done, and four months later the abduction function of the shoulder had sufficiently improved so that it was not necessary to carry out the original recommendation.

SUMMARY

1. The operation described, in which the scapulae are tied together with fascia lata, is designed to improve abduction power of the shoulder when there is combined weakness of the deltoid and rhomboid muscles.

2. It is one of the few operations which should be done early in cases of poliomyelitis. It will prevent adduction contractures of the shoulder, which are prone to occur with this distribution of paralysis. It makes possible splinting of the shoulder in abduction, while the scapulae are

maintained in adduction. Thus antagonistic muscles are at the same time put in the favorable position of rest.

3. Abduction power of the shoulder is improved because the scapulae are stabilized, thus providing a point of fixation against which the weakened deltoid may more effectively work.

4. This operation does not supplant other muscle transplantations now in use for deltoid paralysis. It has proved to be a valuable adjunct, and is particularly useful when there is marked weakness of the rhomboid muscles and only moderate weakness of the muscles of shoulder abduction.

UTILIZATION OF THE BODY WEIGHT IN TREATMENT OF THE RESIDUAL DEFORMITY IN CLUB FEET

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The conservative treatment of club feet by plaster requires considerable skill and much patience. By the time the child begins to walk the feet should be in the overcorrected position, but this is not always possible. The two chief deformities, inversion and forefoot adduction, are, in many cases, still present to a greater or lesser degree. By encasing the feet in plaster in the position of maximum correction and allowing the child up, it is hoped that the body weight will have a beneficial influence in stretching shortened structures and in diminishing the residual deformity.

Such a plaster, however, is merely retentive, and it was with the object of encouraging progressive correction of forefoot adduction and inversion inside the plaster that the following method was devised.

METHOD

1. Stockinet is drawn over the powdered limb up to the groin and allowed to protrude three inches beyond the toes.

2. The whole of the foot is covered with a thin layer of cotton wool. The cotton wool is continued up the medial side of the leg from the internal malleolus to the prominence of the knee joint.

3. Two pieces of sorbo rubber sheeting, one centimeter thick, are cut. This is the protective sheeting used in radium treatment. One piece is placed along the medial border of the foot from the tip of the great toe to the point of the heel. It should be broad enough to cover the heads of the first two metatarsals. The second piece is of equal length, but is somewhat wider and is laid over the internal malleolus and medial part of the os calcis; the lower end rests on the upper surface of the first pad. (See Figure 1.)

4. Two two-inch cellona bandages are then applied over the foot and

FIG. 1

Showing the two pieces of rubber sheeting applied to the foot.

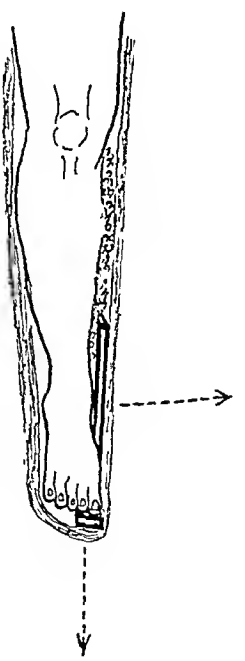

FIG. 2

Two bandages are applied lightly over cotton wool to form a cylindrical mold.

rubber pads, extending up to the mid-thigh. These bandages should not be applied tightly to the contours of the leg, but lightly over the cotton wool to form a cylindrical mold. (See Figure 2.)

5. With one cupped hand controlling the knee and with the patient's foot projecting over the end of the table, the operator everts and abducts the foot to the fullest possible extent. The plaster is then dried with a "blower".

6. When the plaster is sufficiently dry to retain the foot in the corrected position, the upper and lower ends of the stockinet are pulled down to turn the plaster edge.

7. The foot is now in the everted and abducted position, and, in order to form a flat sole, a piece of cellona bandage is placed as a bar along the outer border of the sole and a final ordinary plaster bandage is applied over all. (See Figure 4.)

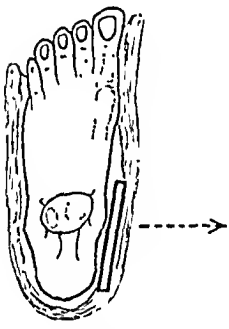

FIG. 3

Horizontal view, showing pad in position.

When the child is at rest, this is a plaster of retention, the foot deformity having been corrected to the maximum extent by manipulation. As soon as the erect position is assumed, the plaster being a cylinder and the knee being straight, the body weight is transferred directly to the feet. The sole of the plaster rests evenly on the floor, and the sole of the foot rests on an inclined plane, the medial part of which is a compressible rubber pad. (See Figures 2 and 4.)

FIG. 4

Showing the foot in the everted and abducted position with the sole resting on an inclined plane, the medial part of which is a compressible rubber pad.

There is some degree of vertical play of the limb inside the plaster, and two corrective movements are initiated. The medial side of the foot sinks downward, thus correcting inversion. It is obviously impossible for the forefoot to pass laterally up an inclined plane, but forefoot adduction can be corrected by movement of the hindfoot in the opposite direction. The vertical pad permits the internal malleolus and the os calcis to pass medially, the medial part of the forefoot being fixed by the plaster. This movement corrects forefoot adduction. (See Figures 1, 2, and 3.)

These two corrective movements are in constant action as long as the child is in the erect position. The child is literally walking on the shortened structures, the limit of correction being the limit of compressibility of the pads.

It is clear that success depends upon the achievement of maximum manipulative correction of the foot at each application of plaster.

On the first application of the cast this represents *capital.*

The gain at the next sitting represents *interest.*

That at subsequent sittings represents *compound interest.*

The plantar pad must project just beyond the border of the foot medially in order to allow true vertical play of the foot and to prevent friction of the great toe on the medial border. (See Figure 4.) Pads thicker than those advocated increase the play of the leg, render the cast cumbersome and difficult to retain, and may cause pain and friction.

If the foregoing details are adhered to, anyone familiar with plaster technique can apply this cast quickly and efficiently. It is an inexpensive and easy method, and is especially useful in treating out-patients.

So rapid has been the improvement of feet treated by this method, both in mobility and in correction of residual deformity, that the writer has adopted it as a routine measure in the treatment of club-foot at the ambulatory stage.

FRACTURE OF THE SCAPULA REQUIRING OPEN REDUCTION

Report of a Case *

BY WALTER R. FISCHER, M.D., CHICAGO, ILLINOIS
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A review of the information on fractures of the scapula in current literature and textbooks reveals that fractures of the scapula are uncommon, they are seldom accompanied by much displacement, and they practically never require open reduction, especially when appropriate treatment is established early. With few exceptions, very little space is devoted to fractures of the scapula in the present-day textbooks on fractures. The essence of the comments is that such fractures are seldom complicated with enough displacement to warrant much anxiety on the part of the surgeon. The treatment which is usually recommended consists in rest in bed and the application of a Velpeau bandage or traction methods, followed by physical therapy measures. There is insufficient information on fractures involving the glenoid fossa, which is one of the most important regions of the scapula because it forms part of the shoulder joint. In most of the cases reported there has been little disability following the treatment, but this is probably due to the fact that very little displacement or unimportant displacement had occurred.

Newell, in a review of 2374 fractures, found only twenty-four cases of fracture of the scapula, in none of which an open reduction was performed. Findlay reported thirty-seven cases of fracture of the scapula treated at the Beekman Street Hospital over a ten-year period; in only one case was open reduction performed and that was unsuccessful. The fractures of the scapula reported in the past show evidence of insufficient displacement to justify operative interference. Fractures of the glenoid and of the body of the scapula are here and there reported, but in no instance do these show sufficient displacement to warrant open reduction. Longabaugh, in 1924, reported an open reduction in a case in which a triangular piece was broken off the lower angle of the bone and displaced upward, interfering with the lifting power of the arm. He explained that in this case the scapula winged outward when the arm was raised because a certain part of the rhomboideus major muscle was detached, thus disturbing the stability of the scapula. Reggio, in the recent textbook on fractures edited by Philip Wilson, describes cases of fracture of the glenoid, two of which appear to be almost identical with the case reported herein. It is stated in this book that in one of these cases the fracture was satisfactorily reduced by traction, while in the other open reduction, which was accomplished by way of the anterior route, was required to treat the fracture properly.

* Read before the Chicago Orthopaedic Society, November 11, 1938.

FIG. 2

Roentgenogram of scapula after open reduction.

FIG. 1

Roentgenogram of scapula at time of injury, showing wide separation of fragments

The scarcity of information in the literature pertaining to the indications for open reduction in certain fractures of the scapula and the fact that surgical measures must be seriously considered in particular instances have prompted the reporting of the following case.

A woman, thirty-seven years of age, appeared for treatment on April 27, 1938, seven days after injury to the right shoulder. She gave a history of having fallen backwards off a low porch, striking the back of her right shoulder forcibly on the ground. Examination revealed an area of bluish discoloration of the skin about the size of a dollar over the body of the scapula. Inspection of the affected shoulder showed it to be swollen, and the head of the humerus was less prominent than that on the opposite side. Roentgenographic examination (Fig. 1) revealed a fracture through the glenoid continued transversely across the body of the scapula to its medial border with wide separation of the fragments, the inferior fragment being drawn downward and lateralward somewhat under the head of the humerus. There was apparently no disturbance in the relationship between the head of the humerus and the upper fragment. Because of the wide separation of the fragments, which it was believed would interfere seriously with the possibility of union as well as the future function of the shoulder, and because traction on the arm in abduction failed to approximate the fragments, and since the fracture had occurred a week previously, open reduction was the form of treatment chosen.

The scapula was approached by the posterior route. There was practically no bleeding, and a silver wire through the spine and the lateral margin was used to affix the fragments (Fig. 2). Subsequent to operation, the arm was supported at an angle of about 45 degrees in a plaster cast. At the end of two weeks active motion was begun. The patient continued to use the cast as a support until the end of the twenty-first postoperative day. She made an uneventful recovery, and, when last seen on July 17, 1938, she could almost fully abduct the arm.

This case, together with those reported by Reggio and Longabaugh, shows that fractures of the scapula do occur with considerable displacement and, if not reduced by open operation, may seriously interfere with the function of the shoulder.

SUMMARY

From the information in the literature concerning the treatment of fractures of the scapula, those which require open reduction are: (1) fractures involving the glenoid in which free motion of the shoulder is seriously threatened and which cannot be reduced sufficiently by traction or manipulative means; and (2) fractures of the body of the scapula which interfere with the unity of the scapula in performing its function as an adjunct to the elevation of the arm.

The author wishes to express his appreciation to Dr. Maynard A. Austin and Dr. J. P. Tracy of Anderson, Indiana for their cooperation in furnishing the original roentgenogram of the fracture.

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CONGENITAL CLUB-HAND DEFORMITY ASSOCIATED WITH ABSENCE OF RADIUS: ITS SURGICAL CORRECTION

A Case Report *

BY ARTHUR J. DAVIDSON, M.D., AND M. THOMAS HORWITZ, M.D., PHILADELPHIA, PENNSYLVANIA

The operation herein described was devised as an alternative procedure following failure of the bone-graft reconstructive operation advocated by Albee. We, however, note that a similar procedure was suggested by Bardenheuer in 1894, and utilized by Tubby in three cases.

MODUS OPERANDI

A three-inch incision was made over the mid-dorsum of the wrist, and the carpus and the lower end of the ulna were exposed. Enough of the distal portion of the ulnar shaft was resected to permit ulnar displacement of the carpus and the hand, and also to allow excison of the distal ulnar epiphysis. (See Figure 1, *A*.) The distal end of the remaining ulnar shaft was split for two inches in its longitudinal axis; the ulnar fragment (*b*) was fractured incompletely to permit wide separation from the intact radial portion (*c*); and this interval was maintained by the interposition of the fragment stripped of periosteum (*a*), which had been removed from the distal end of the ulna. The carpus, its proximal surface denuded of cartilage, was displaced ulnaward and inserted into the bifurcated distal end of the ulna, freshened surfaces contacting in order to secure bone fusion. (See Figure 1, *B*.) The wrist was immobilized in plaster-of-Paris in 20 degrees of dorsiflexion and in slight ulnar flexion.

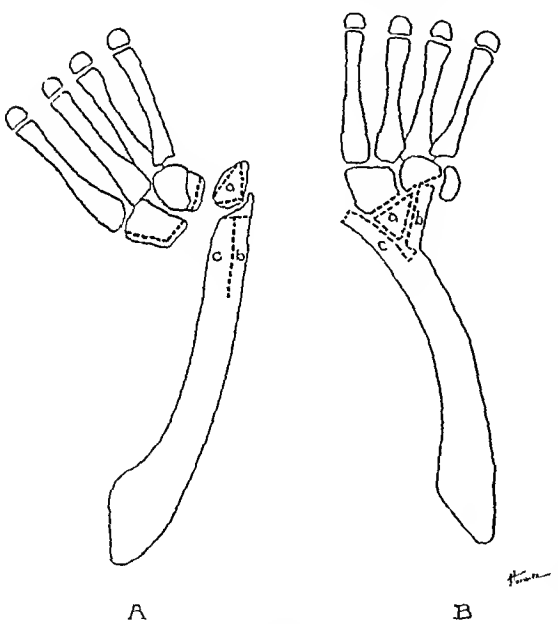

FIG. 1

Diagram showing operative technique.

* Presented at the combined meeting of the Orthopaedic Section of the New York Academy of Medicine and the Philadelphia Orthopaedic Club, Philadelphia, Pennsylvania, November 18, 1938.

FIG. 2

Anteroposterior and lateral roentgenograms of the right hand, wrist, and forearm just prior to operation in July 1938.

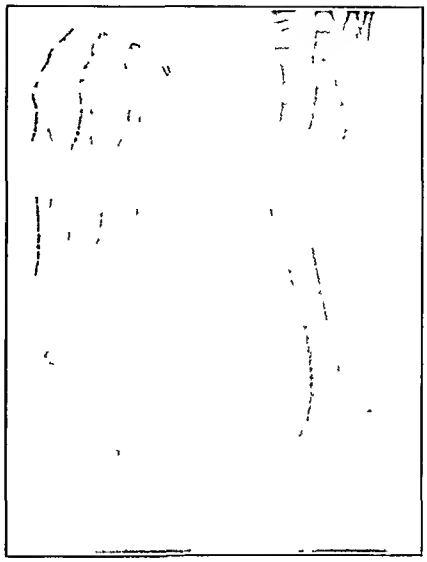

FIG. 3

Anteroposterior and lateral roentgenograms three months after operation.

CASE REPORT

B. S., a male, had been observed by us since his birth in January 1928 with a right club hand associated with an absence of the entire right radius and right thumb, a rudimentary left thumb being the only other defect present. The deformity of the right hand and forearm became increasingly severe, despite constant external fixation and manipulations, and roentgenograms revealed the delayed appearance of only one row of carpal bones. In August 1935, when the patient was seven years of age, an autogenous tibial graft was inserted as a strut into previously prepared sites on the radial aspect between the ulnar shaft and the carpus, but, due to severe tension of the soft tissues following overzealous correction of the deformity, the incision reopened, with exposure and complete absorption of the bone graft and with recurrence of the club-hand deformity (Fig. 2). The procedure described was performed in July 1938. Clinically and roentgenographically (Fig. 3) there is fusion of the wrist, with excellent and apparently permanent correction of the deformity.

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OSTEOCHONDRITIS DISSECANS OF THE ELBOW JOINT *

BY FRANK G. MURPHY, M.D., CHICAGO, ILLINOIS

Osteochondritis dissecans is of fairly frequent occurrence in the knee joint, but it is quite rare in the other joints of the body. It is a joint derangement in which a button-shaped fragment of articular cartilage, with or without subchondral bone, becomes either partially or completely separated at characteristic sites on the articular surface of certain joints. (See Figure 1.)

Other chronic derangements of the joints naturally must be ruled out in considering the differential diagnosis. The most frequent of these conditions are: fracture or separation of the meniscus, osteochondromatosis, articular cartilage injuries, chip fractures, hypertrophic arthritis with detached ossicles at the articular edges, and ligament injuries.

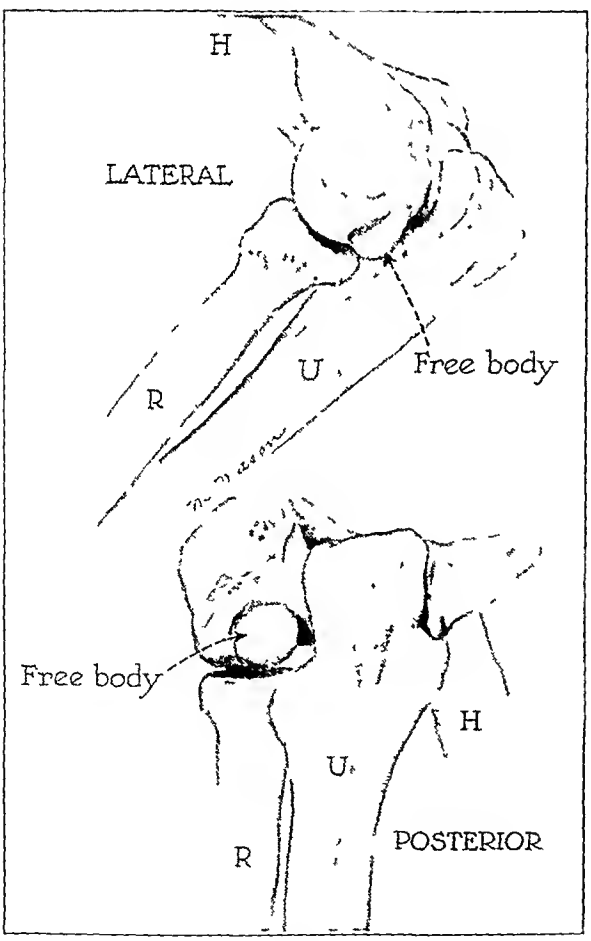

FIG. 1

Artist's conception of osteochondritis dissecans of the elbow joint

In treating this condition, conservative measures are of no value. The condition calls for surgical removal of the loose body. In the knee, a rather extensive incision may be necessary, preferably the parapatellar incision. In the elbow, the incision should be made over the loose body, as determined by palpation and roentgenographic examination. Ryerson[1] has simplified the procedure by fixing the loose body with a hypodermic needle before incision. He then removes it through a very small incision. Subsequent treatment is the same as for any other arthrotomy, which means immobilization for from seven to ten days, thereby giving the joint complete rest for the first few days of healing.

* Read before the Chicago Orthopaedic Society, Feb 1938.

CASE REPORT

M. McG., a well-developed, well-nourished male, aged twenty-one years, a student and ball player, complained of soreness in the left elbow. He stated that at times the joint seemed to click when it was used strenuously, and that the soreness persisted for several days. He had noticed that the soreness and discomfort were especially severe on rotation and he had learned that rest seemed to relieve the condition.

The patient stated that the condition had developed ten years previously when he fell, striking the left elbow against a brick. The elbow had been very sore for two weeks; then there had been improvement for a time, but periods of soreness had been present

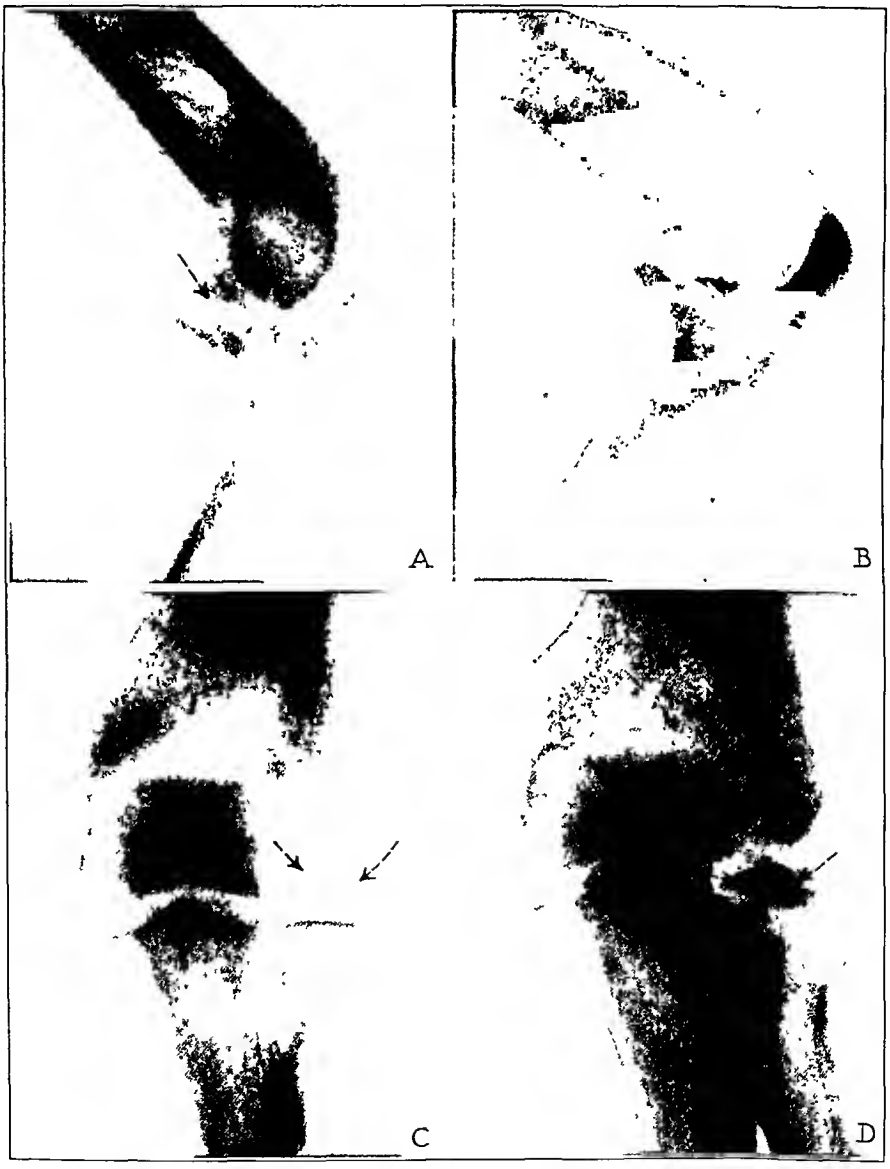

FIG. 2

A and *C:* Roentgenograms taken in 1930, showing rarified bed and the unseparated dense bone.

B and *D:* Roentgenograms taken in 1936, showing loose body in elbow joint.

ever since, especially when the part was used very much. The condition had prevented him from playing ball and had hindered free use of the left arm. He stated that at times flexion was limited to a right angle, with full extension. At other times, extension was limited to a right angle and flexion was free to the normal limit without pain. Occasionally he could feel a free body on the outer side of the joint.

The patient was first seen in 1930, at which time roentgenographic examination showed a rarified area on the capitellum extending around a central dense area (Figs. 2, *A* and 2, *C*).

Three years later examination showed a tender, crepitant, bulbous area just inside the head of the radius posteriorly. Further examination revealed a loose body, which disappeared on manipulation of the elbow; extension was limited to 170 degrees, flexion to 51 degrees.

Roentgenograms taken in 1936 showed a free button-shaped body in the outer compartment of the elbow joint and a defect of corresponding size in the capitellum (Figs. 2, *B* and 2, *D*). A diagnosis of osteochondritis dissecans was made.

The treatment of this case was surgical. A lateral incision was made through the skin and the deep fascia. The foreign body could be felt through the capsule at a point above and behind the head of the radius. The foreign body was removed and the wound was closed. A posterior molded splint was applied for seven days, and the postoperative course was uneventful.

The loose body was found to be oval, button-shaped, and bluish white in color; both surfaces were covered by little rough mounds of glistening cartilage. It was one centimeter long and eight-tenths of a centimeter wide.

Examination one month after operation showed no symptoms with the exception of the former slight limitation of complete extension and complete flexion.

The patient then left for his home in another city. Frequent communications from him since that time, the last one in October 1937, reveal that the good result has been maintained. He is able to play ball and has no disability except for slight limitation of the extreme ranges of motion.

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AN UNUSUAL FRACTURE OF THE TERMINAL PHALANX OF THE FINGER

BY ROBERT A. WISE, M.D., NEW YORK, N. Y.

From the Fracture Service of the Knickerbocker Hospital

Fractures of the phalanges of the hand have recently attracted considerable interest, and the treatment of the usual types is well known. However, a fracture of this group may be encountered in which the usual form of treatment cannot be employed and for which a special method of reduction and fixation must be devised. Such a fracture is described in the report of the following case.

FIG. 1

Roentgenogram taken before reduction, showing the marked displacement of the proximal fragment.

CASE REPORT

L. D., a man of forty-eight, was first seen on March 16, 1938, complaining of a painful, swollen finger. He had caught his right middle finger between two heavy barrels, and, while the proximal two-thirds of the finger was held rigid, a third barrel had rolled against the finger, causing hyperextension of the terminal phalanx.

Examination revealed a swollen, tender, and discolored right middle finger. The terminal phalanx was held in extension and could not be flexed. A small, immovable mass could be palpated beneath the unbroken skin on the flexor surface at the base of the terminal phalanx.

Roentgenographic examination showed a fracture through the proximal portion of the distal phalanx on the palmar surface, the palmar fragment being completely separated and lying at right angles to the phalanx (Fig. 1).

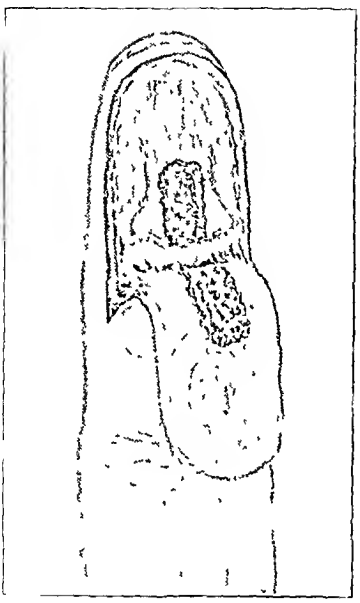

FIG. 2

Drawing made at operation, showing excavated area in the terminal phalanx and the displaced fragment.

An attempt was made, under the fluoroscope, to bring the fragments into apposition, but this was not successful and open reduction was decided upon.

On March 21, 1938, after a lime and soda preparation of the hand, the distal closed space of the finger was opened by a "fish-mouth" incision. On exposing the terminal phalanx, there was seen an excavated area in the bone about one centimeter in length and five-tenths of a centimeter in width, which was filled with an old blood clot. The broken fragment of the terminal phalanx was imbedded in the pulp, and the tendon of the flexor digitorum profundus was firmly attached to it (Fig. 2). The fragment, together with the attached tendon, was placed in the excavated area of the terminal phalanx and held firmly in place by a silver wire, which was passed completely around the phalanx. The incision was closed, and the finger was immobilized in flexion.

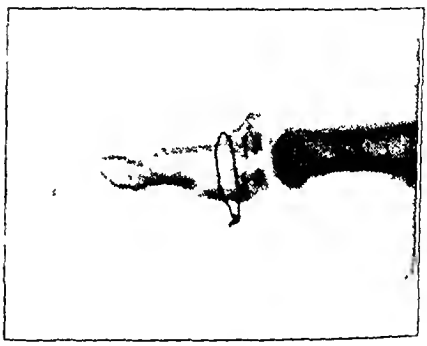

FIG. 3

Roentgenogram taken three weeks after operation, showing the fragment held in place with silver wire.

Convalescence was uneventful, and the patient was discharged on the second postoperative day. The finger was kept in flexion for a period of three weeks, and a roentgenogram (Fig. 3), taken on April 11, 1938, showed the fragment held in place. After this period of immobilization, guarded active motion of the terminal phalanx was encouraged.

Six weeks after operation, all splints were removed and the patient was encouraged to use the finger in every way. Flexion and extension of the distal phalanx gradually improved, and in June 1938, three months after operation, the patient had complete flexion and extension (Figs. 4 and 5).

This case presents two interesting problems,—adequate exposure and satisfactory fixation of the fragments. The type of incision used gave a good exposure of the entire distal phalanx and made it easy to replace the fragment in its proper position. Fixation was obtained by passing a silver wire completely around the phalanx. The "fish-mouth" incision made this procedure simple.

FIG. 4

Photograph taken three months after operation, showing flexion of the distal phalanx.

FIG. 5

Photograph taken three months after operation, showing extension of the distal phalanx.

A fracture of this type might be expected in the presence of pathological changes in the bone. At operation, however, the bone appeared perfectly normal in structure and the roentgenologist could detect no pathological changes other than the fracture. This was an avulsion fracture. The portion of the phalanx to which the flexor digitorum profundus is attached was pulled away from the body of the bone, leaving the tendon attachment intact.

AN INVALID-LIFTING APPARATUS*

BY ROBERT D. MADDOX, M.D., F.A.C.S., CINCINNATI, OHIO

This apparatus was contrived to meet a pressing need in the author's family,—the mechanical raising of the buttocks of a helpless, bedridden invalid three or four inches from the bed to facilitate the use of the pan, proper care, and the change of bed linen. It added much to the comfort of the invalid and the convenience of the attendants.

Subsequent use by other physicians in suitable cases has emphasized its value especially for the aged and the obese. The demands on attendants are less, the care and well-being of the patient are greatly improved, and decubitus is avoided. No contra-indications, failure to function, or untoward incidents have been noted.

The apparatus consists of a rectangular frame of round steel with the bottom and side bars clamped and stabilized by two malleable-iron feet; the top bar is a removable windlass, operated by a self-locking worm gear and a hand crank. A spreader bar is suspended from the windlass by two webbing straps, and a lifting band of wide webbing with detachable D rings is placed under the buttocks. The frame stands independently on the floor and supports the windlass bar crosswise over the bed. The patient is lifted by the windlass after the spreader bar has been lowered and the lifting band has been attached to it by the D rings.

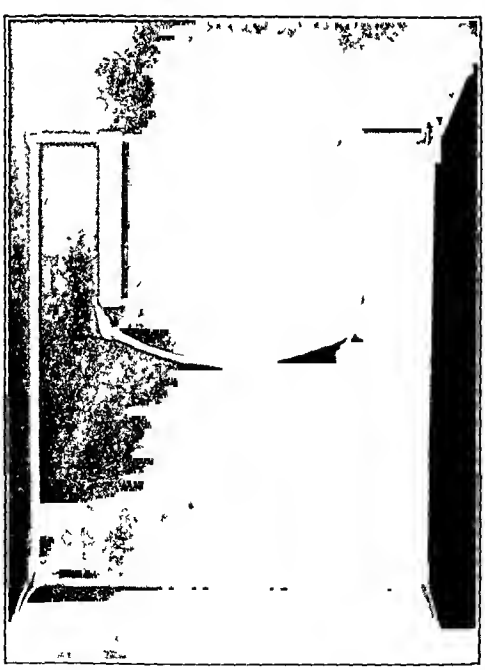

FIG. 1

FIG. 2

* Presented before the Clinton County Medical Society, November 9, 1937.

Set up in readiness, the device measures approximately forty-five by fifty-five inches and is suitable for any bed not over forty-two inches wide. Packed for transport, it measures four by seven by fifty inches and weighs forty pounds. It is extremely simple, amply strong and powerful for the purpose, and can be set up or packed in two minutes.

If conditions require two or more persons to assist a helpless, bedridden invalid, the proper use of this apparatus provides a slow and controlled motion and a sense of security with a minimum of disturbance, for which patients are grateful. The effort demanded is so reduced that one person on duty at any one time is ordinarily sufficient to care for the most difficult case.

A review of the literature, to be published later, indicates a wide and continuing interest in this problem, as many ingenious devices have been reported in the past eighty years, but none appears to employ all the mechanical principles combined in this apparatus or to offer all its advantages.

AN APPLIANCE FOR THE PREVENTION OF RECURRENT DISLOCATION OF THE SHOULDER

BY JOSEF WOLF, M.D., DAVENPORT, IOWA

The brace which the author wishes to describe has proved to be satisfactory in the prevention of recurrent dislocation of the shoulder joint. The use of this brace is indicated particularly in cases in which open operation cannot be performed. This brace is different in several ways from other appliances for this condition which have already been described. No part of the brace covers the upper arm; only a small part of the shoulder is enclosed. It has an adjustable axillary pad, similar to that found in a truss pad. The brace causes only slight limitation of the normal movements of the shoulder.

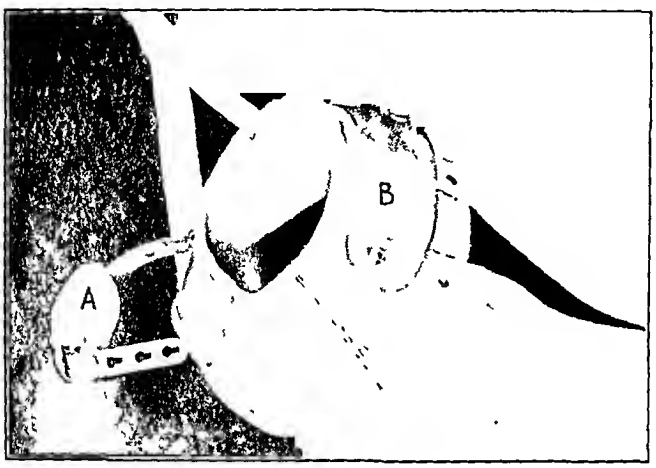

FIG. 1

Anterior view of brace showing the hinged axillary pad (*A*) in an open position. Note the three keyholes on the spring-steel band. After application of the brace, these holes allow fastening of the axillary pad to the clavicular plate (*B*).

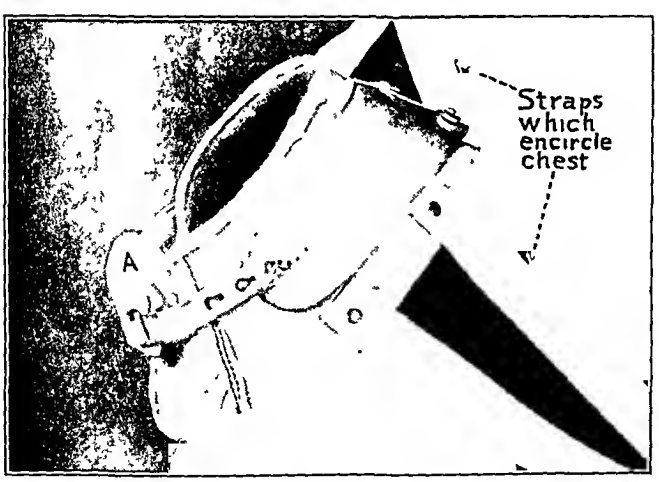

FIG. 2

Anterior view of brace with the axillary pad (*A*) fastened in the first keyhole.

DESCRIPTION OF THE BRACE

A plaster-of-Paris model of the affected shoulder is made with the arm held in a position of horizontal abduction. Over the completed model, a ring of leather is molded to fit the shoulder accurately. The ring of leather is then lined with chamois skin, and is reinforced on the outside with metal, as illustrated in Figures 1, 2, and 3. Suspender straps hold the appliance in place by en-

circling the chest beneath the opposite shoulder.

The metal reinforcement over the leather cuff consists of three separate pieces made of sheet aluminum or steel: (1) a narrow spring-steel band, which holds the axillary truss pad of sponge rubber or felt (*A*) firmly in the axillary space; (2) a molded clavicular plate (*B*); and (3) a flat, molded, scapular plate (*C*). The metal strip is hinged posteriorly, and may be opened for application and closed as snugly as necessary by an adjustable fastener in front. This adjustable fastener consists of a row of three keyholes punched in the anterior end of the axillary metal strip. A metal button, riveted to the clavicular metal plate, fits the keyholes and locks the axillary pad in the desired position.

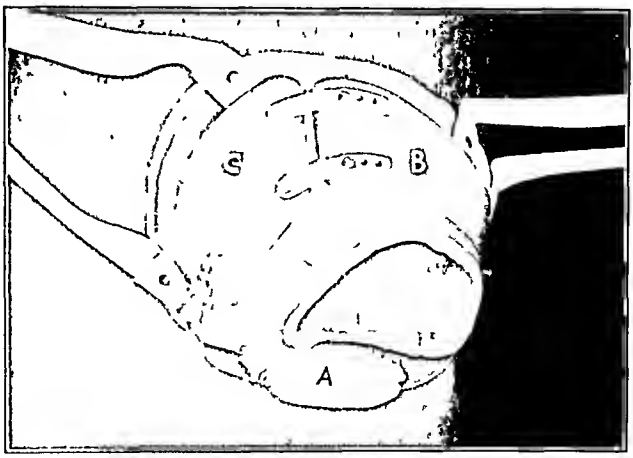

FIG. 3

Lateral view of brace, showing the way in which the axillary pad (*A*) fills the axillary space, thus preventing inferior dislocation of the head of the humerus. This view also shows the scapular metal plate (*C*).

CASE REPORTS

CASE 1. A man, twenty-three years of age, a clerk, had suffered recurrent dislocation of the right shoulder on an average of once a week for several months. The dislocations occurred while reaching over his head for merchandise on shelves. He had also suffered several dislocations while engaged in his favorite sport of rowing, so that he was forced to give up his place on the regatta team. Open operation was suggested, but the patient refused. A brace of the type described was made and fitted. The patient was observed for eleven months after the brace had been fitted, and during this time he suffered only one recurrent dislocation.

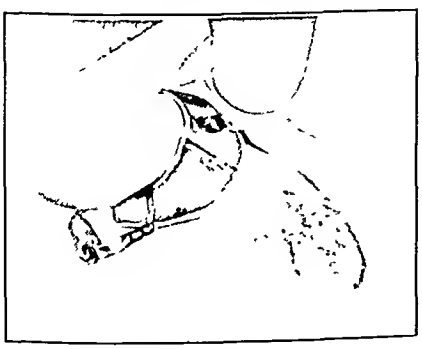

FIG. 4

Anterolateral view, showing application of brace. The axillary pad is still unfastened.

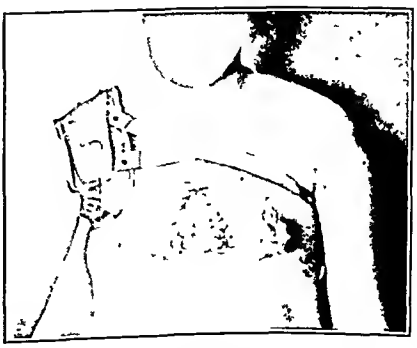

FIG. 5

Anterior view, showing brace in place with axillary pad securely fastened.

CASE 2. A middle-aged woman, suffering from epileps
rent dislocation of the right shoulder joint. The patien
months after a brace had been fitted, and, even though s
epileptic attacks, there was no recurrent dislocation.

CASE 3. A woman, aged fifty-seven years, suffered recu
a fall on the left shoulder; the dislocation recurred approxima
period of six months. A brace was fitted five months ago.
had no repetition of the dislocation.

A NEW KNIFE FOR THE REMOVAL OF THE M

BY WALTER MERCER, F.R.C.S., EDINBURGH, SCOTLAN

In the operation for removal of a meniscus no possible dif
arise in mobilizing the anterior horn, the surroundings of whic
visual direction. Some considerable difficulty, however, may ar
the central portion of the convexity of the meniscus is reached, f
space is curtailed and the available access to the tibial attachm
the meniscus restricts the use of an ordinary scalpel.

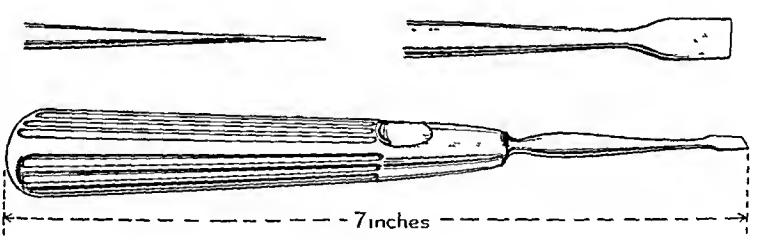

FIG. 1

The knife illustrated will be seen to have the cutting edge placed distally in a manner similar to a miniature osteotome. The handle is strong, giving adequate control of the blade. Division of the attachments of the cartilage in the region of and posterior to the collateral ligaments is accomplished by simply pushing the knife directly backward. Once the cartilage has been mobilized to a position between the condyles, division of the posterior horn can be carried out in the same manner under direct vision. The drawing shows the knife reduced to half size.

A MUSCLE TESTER FOR POLIOMYELITIS CASES

Attachment for a Permanent Record [1]

BY ADOLPH A. SCHMIER, M.D., NEW YORK, N. Y.

This study was undertaken in order to obtain a permanent and more accurate record of the strength of muscle groups in poliomyelitis. At the outset, it must be understood that we are unable to evaluate the strength of individual muscles either by the hand method or by the spring scale which will be later described. The impression that a muscle can contract without stimulating additional synergistic and antagonistic muscles is not generally true. Even the actual strength of a group of muscles cannot be definitely determined, for, when a group of synergistic muscles contract, there is always the antagonistic tonic power to consider. It is, rather, the resultant action of muscle groups in assuming a certain position which we are testing. For clinical purposes, we can disregard the antagonistic factor and assume the determination obtained to be actual muscle strength.

Because of the desire to test muscle strength more accurately and also to obtain a permanent record thereof, the author designed an ink-pointer attachment to an ordinary scale. Testing the strength of muscles with a spring scale is not a new procedure. Lovett and Martin published this procedure in 1916. However, with their method, in addition to the examiner, assistants were necessary to hold the extremity and to observe

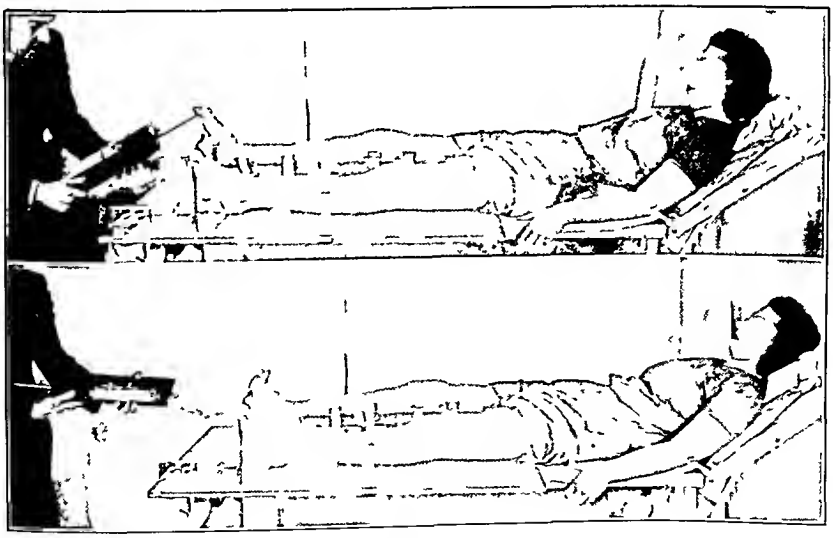

Fig. 1

Above: Testing flexors of big toe.
Below: Testing extensors of foot.

* Presented at the Orthopaedic Departmental Conference of the Hospital for Joint Diseases, February 15, 1938.

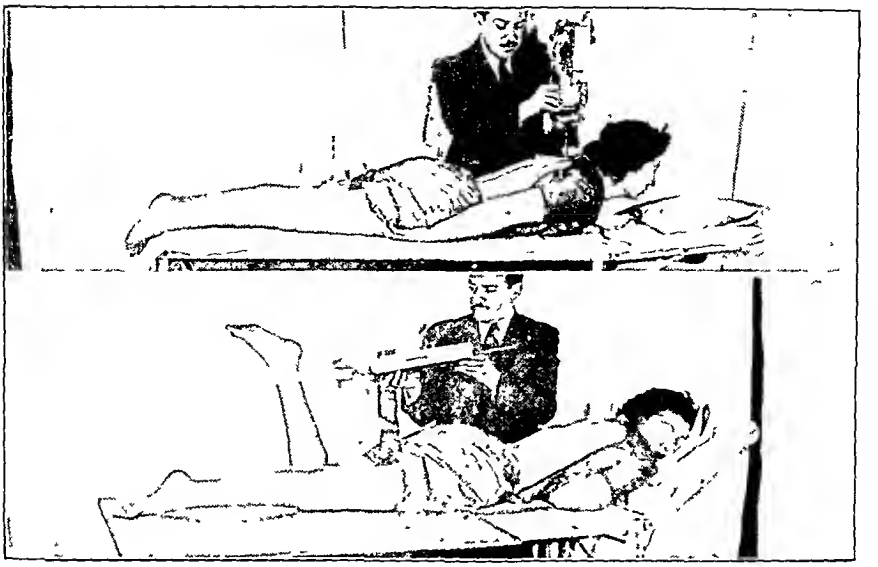

FIG. 2

Above: Testing extensors of the spine.
Below: Testing quadriceps.

the reading on the scale at the moment the muscle gave. In order to make it possible for the examiner to carry out this procedure alone, the author attached an inker to the scale, which records the maximum muscle power on a printed chart. In addition, accessory appliances were made to fix the untested portion of the extremity, which ordinarily would have to be held by an assistant. A set of three scales is employed in order to test muscles of various strengths. The six-pound scale is graduated in ounces; the fifty-pound scale, in half pounds; and the 100-pound scale, in

FIG. 3

Above: Testing external rotators of the hip.
Below: Testing abductors of the hip.

pounds. It is important to note that in the presence of fixed contractures, purely muscular movements cannot be charted accurately, and the readings must, therefore, be accepted with care.

When testing muscle strength with the muscle tester, it is important always to employ the same technique. An attempt should be made to eliminate all sources of error. Certain factors, such as the size and growth of the extremity, the chemical composition of the muscle, and the innervation of the muscle—are beyond our control. The conditions under which the tests are made, however, should be uniform. The temperature of the part examined should be approximately the same at repeated tests. A cold extremity cannot function as well as a warm one. The position of the extremity in testing given muscles should always be similar. In the

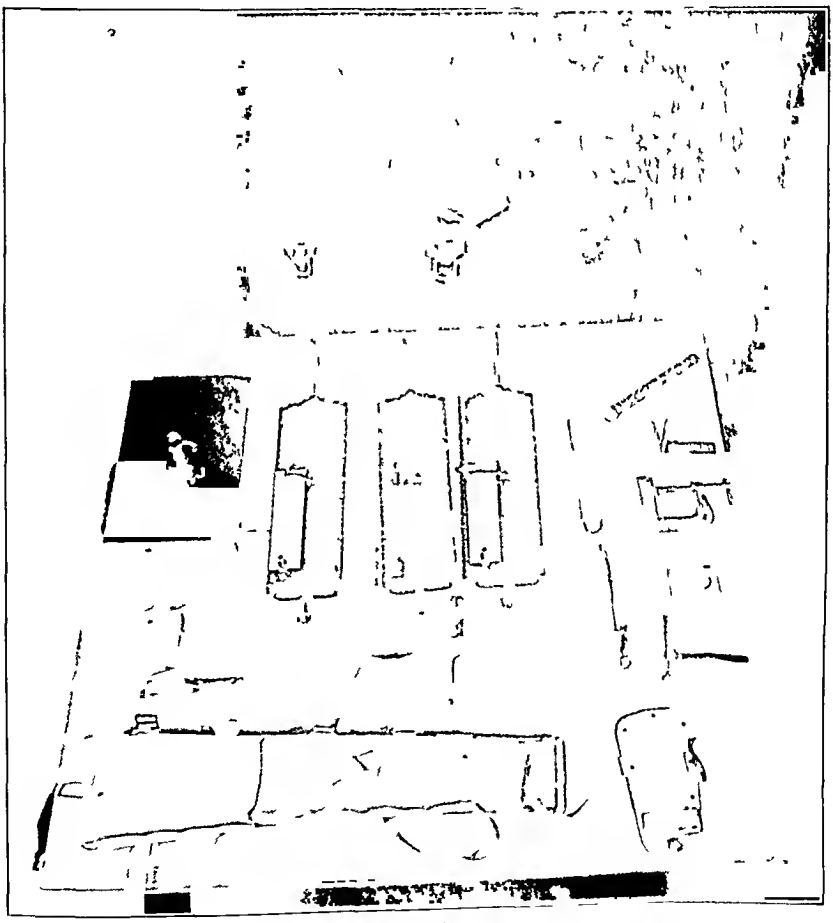

FIG. 4

Illustrating the three spring-scale muscle testers and accessory appliances. Two of the scales have charts attached. Note the ink-pointer attachments. In the foreground is seen a sectioned trough to immobilize the lower extremity. A detachable foot piece is on the right. Above the trough are seen two braces to fix the wrist when testing pronation and supination. To the left of the scales is a platform mounted on ball-bearing rollers. In the background is a box into which all of the pieces of apparatus fit. To the right of the scales are a shoulder brace, web strappings, clamp, and finger appliance.

writer's experiments, he has found that a muscle is stronger when its origin and insertion are approximated. For instance, in one case the strength of the hamstrings was eighteen and one-half pounds when the knee was flexed, but only sixteen pounds when it was extended. Other tests showed larger variations. In other words, a muscle is stronger when pulled against in its contracted state than when it pulls against a resisting force in its elongated state.

After the initial determination of muscle weakness, it is highly important to repeat the test at definite intervals in order to evaluate the comparative strength of the involved muscle groups. The table thus charted records the progress of the case and prognosticates the recovery or lack of recovery of the involved muscles. This comparative determination at regular intervals is a definite guide to the value of the treatment being given to the patient. Excessive electrical stimulation, vigorous massage, and overexercise of paralyzed muscles will tend to weaken rather than to strengthen them.

It seems reasonable to assume that further advantages of the spring muscle tester will be noted as it is used in more cases.

The author wishes to express his appreciation to Dr. Leo Mayer for initiating his interest in this problem, and to Mr. Schwartz, in charge of the brace shop at the Hospital for Joint Diseases, for his cooperation in making the accessory appliances which are necessary in using the scales. The cases tested for the data presented were from the Services of Dr. Leo Mayer and Dr. Harry Sonnenschein of the Hospital for Joint Diseases.

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Certain Aspects of Infantile Paralysis, with a Description of a Method of Muscle Testing. J. Am. Med. Assn., LXVI, 729, 1916.

ISOLATED DISLOCATION OF THE CARPAL NAVICULAR

A Case Report

BY JOSEPH R. KUTH, M.D., DULUTH, MINNESOTA

Because of its rarity and other unusual and interesting features, the following case, which came under the author's observation some time ago, is here reported.

C. L. R., male, aged fifty-two years, a motorman, was injured on March 24, 1937, when the street car which he was operating was struck by a truck; the truck crashed into the front and left side of the car where the patient stood grasping the knob of the controller handle with the left hand. The force of the impact broke off the controller handle, and the patient sustained an injury to the left wrist. Shortly after the accident he went to a hospital, where roentgenographic examination revealed dislocation of the left carpal navicular (Figs. 1-A and 1-B). Attempts at replacement of the bone, undertaken under general anaesthesia, were unsuccessful, and the patient was then brought to the writer's office some two and a half hours after the accident.

On the lateral aspect of the left radius, the navicular could be identified underneath the skin by its size and shape on inspection and by palpation. The styloid of the radius could be felt one-half an inch distal to the distal end of the dislocated bone, further displacement of the bone having occurred since the roentgenograms (Figs. 1-A and 1-B) were taken. The bone was quite freely movable underneath the skin. No swelling of

FIG. 1-A

FIG. 1-B

Roentgenograms of left wrist, taken on March 24, 1937, showing dislocation of the navicular.

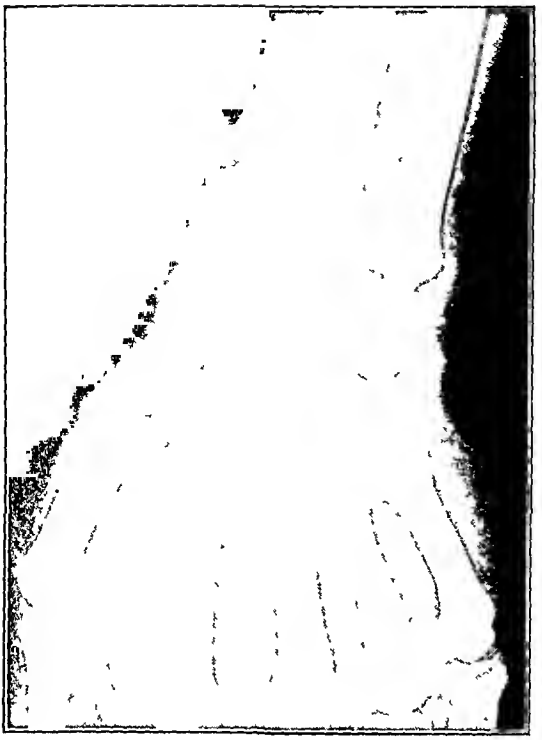

FIG. 2

Stereoscopic roentgenogram of left wrist, taken on September 13, 1937, showing some atrophy of the bones and a small fracture of the greater multangular.

the soft parts and no sign of bruising about the wrist or hand were noted.

Without effort the displaced bone was pushed to the volar surface of the extended wrist, where it slipped back into place. The reduction was done quite painlessly without anaesthesia. Stereoscopic roentgenograms of both wrists, made immediately, showed replacement of the previously dislocated bone.

The injured wrist was then fixed in a plaster dressing, extending from the knuckles of the hand to the bend of the elbow, with the hand mid-way between flexion and extension. The dressing was left in place for five weeks. After removal of the plaster, physiotherapy and increasing use of the hand and wrist were continued to the latter part of July. On August 2, the patient began working a few hours daily.

The patient was last seen on September 13, 1937, and at that time was working as a motorman four hours daily. He admitted gradually increasing use of the wrist, but he stated that after holding the controller knob for some time the wrist and hand, especially the hand, ached some. Examination of the left wrist showed a loss of 20 degrees of dorsal extension and 15 degrees of volar flexion. Other movements of the left wrist appeared to be normal. There was no appreciable swelling. Stereoscopic roentgenograms of both wrists on September 13 revealed some atrophy of the bones of the left carpus, but nothing suggesting a dead navicular. In these roentgenograms, as well as in those taken previously, there was also noted a small (apparently a tear) fracture of the greater multangular (Fig. 2).

On March 3, 1938, the patient died at St. Mary's Hospital of generalized tuberculosis, which began with symptoms of pleurisy with effusion in the fall of 1937. At

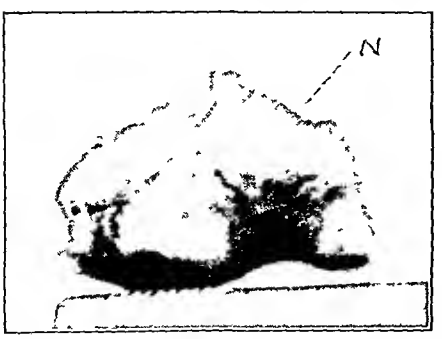

FIG. 3-A

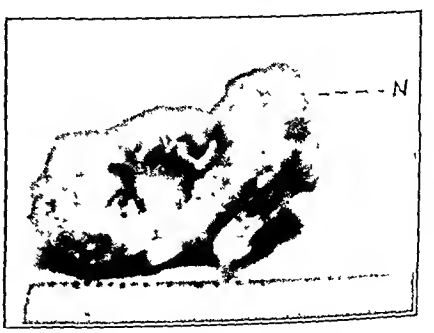

FIG. 3-B

Autopsy specimen. The navicular, lunate, and triangular were removed *en masse* with their fibrous and ligamentous attachments.

autopsy some hours later, the navicular, lunate, and triangular were removed from the left wrist through a volar incision. The ligaments and capsule of the wrist were found firm and resistant. It was only with considerable difficulty that the three carpal bones were removed *en masse* with their fibrous and ligamentous attachments (Figs. 3-A and 3-B). During the removal of the bones, the cartilage on the radial articular surfaces of the navicular and lunate was nicked, but otherwise these bones appeared quite normal. The navicular had healed in place firmly (Fig. 4). Section of the three bones showed the same normal bone structure in all, with no evidence of injury of the navicular (Figs. 5-A, 5-B, and 5-C).

FIG. 4

Roentgenogram of autopsy specimen, showing that the navicular had healed in place firmly.

In this case, just as in most cases described in the literature, it is difficult to determine very definitely the exact manner in which the

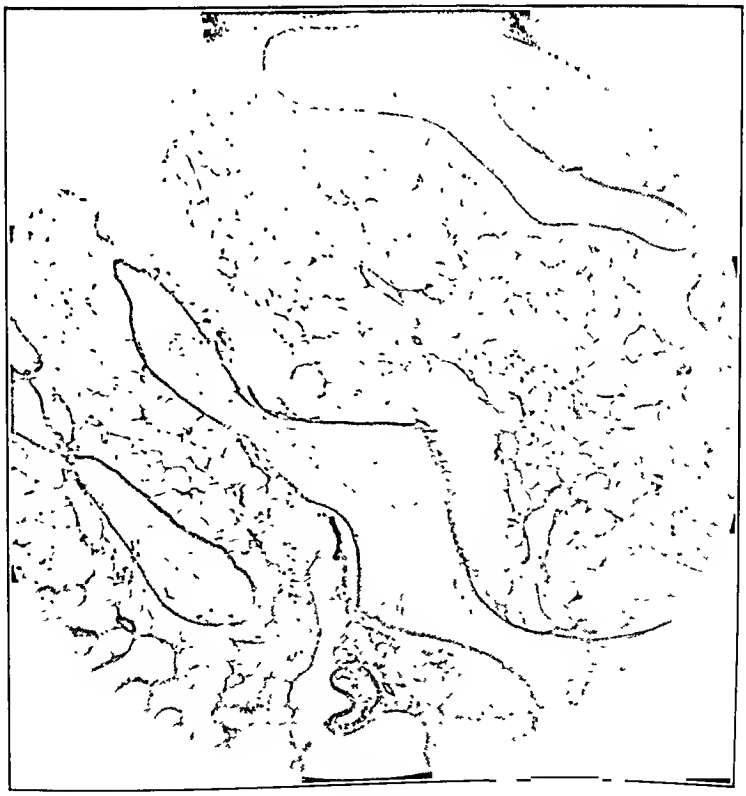

FIG. 5-A

FIG. 5-C

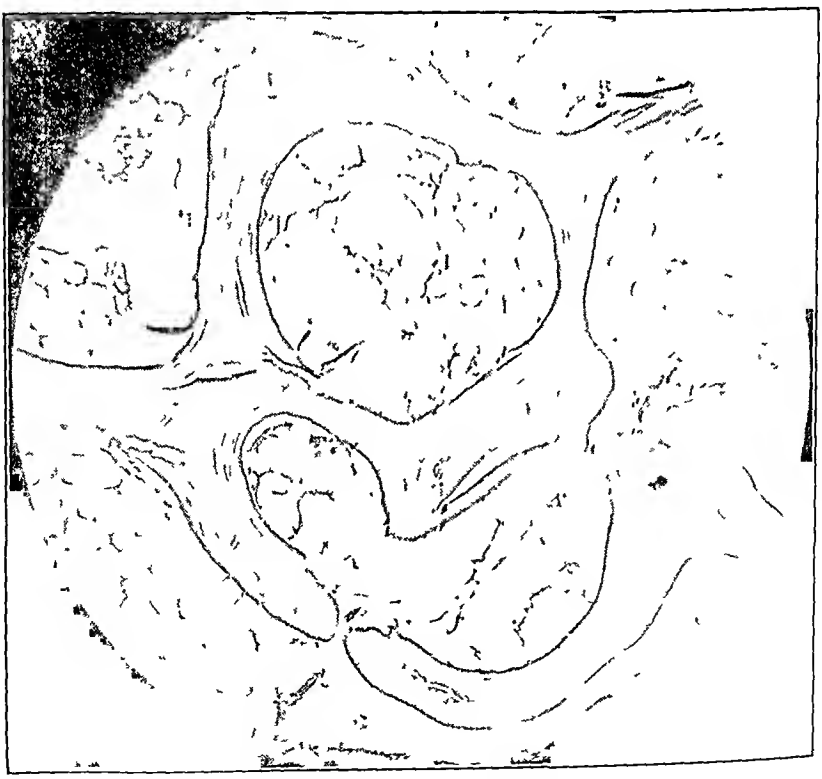

FIG 5-B

dislocation was produced. Upon close questioning of the patient, it seemed most probable that at the time of the accident the left hand was in a position of dorsal extension and ulnar flexion of the wrist with the thumb abducted, the force being transmitted through the left palm and through the second and third metacarpal bones and the capitate against the navicular. The presence of the fracture in the greater multangular would further suggest such a mechanism.

TREATMENT OF FRACTURES OF THE NECK OF THE FEMUR BY INTERNAL FIXATION

REPORT OF THE FRACTURE COMMITTEE OF THE AMERICAN ACADEMY OF ORTHOPAEDIC SURGEONS *

INTRODUCTION

The Chairman was instructed by the Fracture Committee at the Meeting in Memphis, Tennessee, to write an introductory note to this report. This he is very glad to do, particularly since it makes it possible for him to point out that this report represents the work of only one man, the Secretary, Dr. H. Earle Conwell. A sub-committee has now been appointed, not only for the purpose of aiding the Secretary, but also to ensure an unprejudiced evaluation of results. The cases included in this report will be studied for two or more years,—that is, for a period of time sufficient to obtain true end results.

The surgeons who have cooperated by reporting their cases will be circularized annually until the conclusion of this study; anteroposterior and lateral roentgenograms of all the cases included in this report will be requested and studied by all the members of the Committee. It is to be hoped that all the members who have made it possible to launch this rather ambitious study by reporting their cases will see it through to a successful conclusion by continuing to report their cases.

This report, then, should be considered as a first installment of a "continued story"; it is intended to stimulate interest in the search for truth about the treatment of fractures of the neck of the femur by internal fixation.

M. N. SMITH-PETERSEN, M.D., *Chairman*

REPORT

Material

Total number of cases: 1485 reported by 100 orthopaedic surgeons and clinics.

Total number of roentgenograms reviewed: Approximately 6000.

Total number of prints made from roentgenograms: 2309.

The entire membership of the Academy was circularized; 200 members responded. One hundred of these stated that they had not done any internal fixation for femoral-neck fractures; two volunteered the information that they hoped they never would.

*Presented at the Annual Meeting of the American Academy of Orthopaedic Surgeons, Memphis, Tennessee, January 19, 1939.

Age

The oldest patient was ninety-four years of age; the youngest was twelve years old. The average age was sixty-two years.

Sex

There were 1210 females and 275 males.

Historical

The earliest case reported in which internal fixation was used was in 1903. The subsequent distribution of cases by year was as follows:

Year	*No. of Cases*
1903	1
1918	1
1925	4
1926	3
1927	5
1928	9
1929	11
1930	13
1931	7
1932	10
1933	45
1934	78
1935	183
1936	482
1937	489
1938	144

The apparent slump in 1938 is easily accounted for; many of the surgeons did not report cases less than one year old.

Type of Fracture

There were 347 transverse subcapital fractures; 486 transverse fractures of the middle third; 218 transverse basilar fractures. There were 306 oblique, 68 comminuted, and 60 impacted fractures.

Anaesthesia

A general anaesthetic was given in 865 cases, a spinal in 327, a local in 259, and an intravenous in 34.

Operative Procedure and Means of Internal Fixation

Arthrotomy was performed in 228 cases; closed reduction, followed by internal fixation of some type, was done in 1257. The methods of internal fixation were as follows:

Method	*No. of Cases*
Smith-Petersen flanged nails	883
Moore pins	396
Knowles pins	71
Steel spikes or lugs	25
Kirschner wires or some other type of wire	36
Screws	61
Beef-bone pegs	4
Autogenous grafts	9

The means of internal fixation was removed in 202 cases at an average date of eight months after its introduction.

Position Obtained

Anatomical position was obtained in 857 cases, a valgus position in 426, and a varus position in 202.

Postoperative Treatment

In 791 cases no postoperative fixation was used. Plaster casts were used in 312 cases, and traction was applied in 319.

Length of time of postoperative fixation:	Average, 2 months.
Use of wheel chair:	Average, 29 days.
Use of crutches without weight-bearing:	Average, 46 days.
Full weight-bearing permitted:	Average, 5 to 8 months.
Duration of hospital stay:	Average, 45 days.

Postoperative complications were as follows:

	Complication	*No. of Cases*
1.	Infection	44
2.	Pulmonary involvement:	
	Pneumonia	44
	Embolism	4
	Oedema	1
	Pleurisy	7
	Bronchitis	5
3.	Decubitus ulcer	38
4.	Cardiac involvement:	
	Heart failure	19
	Coronary thrombosis	7
	Angina pectoris	2
5.	Diabetes	9
6.	Phlebitis	9
7.	Arthritis	8
8.	Genito-urinary involvement:	
	Acute nephritis	4
	Uraemia	3
	Cystitis	4
	Pyelitis	3
9.	Psychosis	10
10.	Cerebral hemorrhage	3
11.	Delirium tremens	3
12.	Septicaemia	3
13.	Influenza	2
14.	Colitis	2
15.	Shock	2
16.	Osteomyelitis	1
17.	Asthma	1
18.	Ileus	1
19.	Acute tonsillitis	1

Results

Total number reported	1485 cases
Non-union	173 cases
Necrosis of the head	46 cases
Necrosis or absorption of the neck	127 cases
Union	882 cases
Total of unions and non-unions	1055 cases
Percentage of non-union	16.4
Percentage of non-union in relation to the total cases reported	11.6

Deaths

There were 127 deaths (8.5 per cent.), of which eighty-three occurred within thirty days after operation. Twenty of these occurred within a week. The causes of death were as follows:

	Cause	*No. of Cases*
1.	Pulmonary involvement:	
	Pneumonia	35
	Embolism	2
	Bronchiectasis	1
	Oedema	1
2.	Cardiac involvement:	
	Heart failure	12
	Coronary thrombosis	7
3.	Uraemia	6
4.	Septicaemia	4
5.	Infection	2
6.	Diabetes	3
7.	Embolism	2
8.	Cerebral hemorrhage	3
9.	Cerebral embolism	1
10.	Anaemia (?)	1
11.	Purpura	1
12.	Pellagra	1
13.	Delirium tremens	1

H. Earle Conwell, M.D., *Secretary*

ERNST FREUND

1902–1938

Born in Vienna in 1902, Dr. Ernst Freund died suddenly in Los Angeles, California, on December 12, 1938.

The record of Dr. Freund's career was marked by a sequence of brilliant successes. At the age of thirty-six, few men in a specialized field of surgery have gained such well-merited distinction. Few have offered more promise for the future.

Graduating from the *Medizinische Fakultat der Universitat Wien* in 1926, he entered the Department of Pathology, where he rose to the rank of First Assistant. Prof. Erdheim paid him the tribute of calling him "the greatest student I have ever taught". Interest in orthopaedic surgery led Dr. Freund to the *Istituto Ortopedico Rizzoli* in Bologna, where his work under Prof. Putti won him the offer of an assistant professorship. In 1931 he came to the United States, where he was associated with the Hospital for Joint Diseases in New York City, under the Frederick Brown Orthopaedic Research Fellowship. In 1932, at the invitation of Dr. Arthur Steindler, he became Instructor in Pathology in the Orthopaedic Department of the Iowa University Hospitals. He remained with Dr. Steindler for four years and rose from the rank of Instructor to that of Associate Professor in Orthopaedic Surgery. Then, after working with Dr. Fred H. Albee at the Florida Medical Center, in Venice, Florida, he began the private practice of orthopaedic surgery in Los Angeles and was Associate Professor of Orthopaedic Surgery at the White Memorial Hospital.

During this time Dr. Freund contributed liberally to the scientific literature. Perhaps his most important contribution was a treatise on aseptic necrosis of bone. In addition to research studies, he acquired unusual skill in the technical field of bone surgery. He planned his operations carefully, with full appreciation of mechanical values and a thorough knowledge of anatomy. By his surgical ability alone, he has set an example which many of his junior associates will always seek to follow.

Aside from his chosen profession, he had many interests, especially literature and drama. As a linguist, he could lecture in three different languages and could read three more. In conversation, he was most agreeable and stimulating, with a wide fund of knowledge and a quick response to new ideas. Unlike so many European visitors, he appreciated the values of American culture, rather than stressing obvious shortcomings. He often expressed his sincere and unfailing faith in America's future.

Dr. Freund's interest in orthopaedic surgery was primarily that of the scientist, but this did not overshadow the kindly gentleness of his spirit. He was, moreover, extremely conscientious, incapable of neglecting any detail of preoperative or postoperative care. These qualities won him the universal admiration, trust, and friendship both of his patients and of his colleagues. There was much in Dr. Freund's nature which recoiled from the ugly combat of Life; yet Fate held in store for him an overwhelming burden of personal afflictions. It is not the tragedy of his life, however, that most of us who knew him well will chiefly remember. Rather will we recall the cultured, kindly companion who welcomed and reciprocated our friendship.

News Notes

The Fifty-Third Annual Meeting of the **American Orthopaedic Association** will be held in Buffalo, New York, June 5 to 8, 1939, under the Presidency of Dr. W. W. Plummer. Although the final arrangements and order of the program have not been completed, the tentative list of speakers and their subjects is as follows:

Temperature-Controlled Healing of Experimental Fractures.
Dr. Kellogg Speed, Chicago, Illinois.
Dr. Egbert Fell, Chicago, Illinois. (By invitation.)

Blind Nailing of the T Fracture of the Lower End of the Humerus Involving the Joint.
Dr. Oscar Lee Miller, Charlotte, North Carolina.

Compression Fractures of the Vertebrae in Diabetes.
Dr. Mark H. Rogers, Boston, Massachusetts.

A New Approach to the Wrist Joint.
Dr. M. N. Smith-Petersen, Boston, Massachusetts.

Orthopaedic Treatment of Marie-Strümpell Type of Arthritis.
Dr. Loring T. Swaim, Boston, Massachusetts.

Discussion of Bone Tumors.
Dr. Louis Kress, Buffalo, New York. (By invitation.)

Spasmodic Torticollis.
Dr. J. T. Rugh, Philadelphia, Pennsylvania.

The Structure and Function of the Ligamentum Teres and Havers' Gland of the Hip Joint.
Dr. George W. Wagoner, Haverford, Pennsylvania.

A Further Study of the Head and Neck of the Femur in the Growing Child.
Dr. W. E. Wolcott, Des Moines, Iowa.

Fracture of the Neck of the Femur Treated by Combining Smith-Petersen Nail and Graft without Opening the Joint.
Dr. W. E. Gallie, Toronto, Canada.

Epiphysitis of the Spine. End Results of Sixty-Two Cases.
Dr. John G. Kuhns, Boston, Massachusetts.
Dr. Louis Nathan, Boston, Massachusetts. (By invitation.)

The End Results of Epiphyseal-Arrest Operations.
Dr. C. Howard Hatcher, Chicago, Illinois. (By invitation.)

Presidential Address.
Dr. W. W. Plummer, Buffalo, New York.

In addition, two symposia are to be presented: (1) "Acute Hematogenous Infections of the Bones and Joints with Special Reference to the Proper Time for Surgical Intervention", Dr. D. E. Robertson, Toronto, Canada, Chairman; (2) "Fractures of the Shaft of the Femur", Dr. Philip D. Wilson, New York, N. Y., Chairman.

The next examination of the **American Board of Orthopaedic Surgery** will be held in conjunction with the meeting of the American Medical Association at St. Louis, Missouri, in May 1939.

Dr. C. C. Yount has announced the resumption of his practice of orthopaedic surgery on February 1, 1939, in Suite 519, Medical Arts Building, Fifth Avenue and Atwood Street, Pittsburgh, Pennsylvania.

Dr. R. D. Severance announces the association with him of Dr. R. C. Farrow in the practice of orthopaedic surgery at 713 East Genesee Street, Syracuse, New York.

Dr. Walter Scott announces the opening of his offices for the practice of orthopaedic surgery and the treatment of fractures at 6777 Hollywood Boulevard, Hollywood, California.

The Sixty-Eighth Annual Meeting of the **American Public Health Association** will be held in Pittsburgh, Pennsylvania, October 17 to 20, 1939, with headquarters at the William Penn Hotel.

The Ninth Sir Robert Jones Lecture was given at the **Hospital for Joint Diseases** on February 23, 1939, by Dr. A. Bruce Gill. The subject of the lecture was "Treatment of Congenital Dislocation of the Hip".

The **Pan-Pacific Surgical Congress** will be held in Honolulu in September 1939. Any person desiring to present an orthopaedic paper before that Association should address the American Chairman for the Orthopaedic Section, Dr. Steele F. Stewart, 3780 Wilshire Boulevard, Los Angeles, California.

At the meeting of the **Pittsburgh Orthopaedic Club** on January 26, 1939, the following officers were elected:

President: Dr. William O. Markell
Vice-President: Dr. John A. Heberling
Secretary-Treasurer: Dr. Wilton H. Robinson

A Clinical Conference was held at the **Florida Medical Center**, Venice, Florida, from January 23 to 25, 1939, an interesting feature of which was a symposium on "Arthritis". Other subjects of orthopaedic interest were discussed by representative men from different parts of the United States, and an opportunity of viewing operative clinics was given.

At a recent meeting of the **Balkan Medical Union** action was taken to stimulate the interest of all medical societies in developing methods designed to relieve the suffering which is consequent to war. This Union has appealed to the physicians of all nations to take active measures to fulfill their professional and humanitarian duty of awakening and stirring public opinion.

The Fifth **International Exhibition of Cripples' Work** will be held in Seymour Hall, Seymour Place, London, W. 1, from October 19 to 21, 1939. This Exhibition is sponsored by the Central Council for the Care of Cripples and its object is to stimulate and encourage the work of cripples and to promote their education and training by an interchange of ideas and methods. Applications for space should be sent before May 1 to Miss M. Drury, Exhibition Secretary, 34, Eccleston Square, London, S.W. 1.

The **Istituto Ortopedico Rizzoli** of Bologna announces the opening on January 1, 1939, of the competition for the **Umberto I Prize** of 3,500 lire. This Prize is awarded for "the best work or invention in orthopaedics". Italian and foreign scientists are invited to take part in this competition. Applications for the competition and requests

for information in regard to the rules should be sent to the President of the Istituto Ortopedico Rizzoli, Bologna Italy. The competition closes on December 31, 1939.

The Twenty-Fourth Annual Meeting of the **American Association of Industrial Physicians and Surgeons** with the **American Conference on Occupational Diseases and Industrial Hygiene** will be held at the Hotel Statler, Cleveland, Ohio, from June 5 to 8, 1939. An interesting program will be presented by speakers of outstanding experience in the problems involved in industrial health. Information in regard to this meeting may be obtained from A. G. Park, Convention Manager, 540 North Michigan Avenue, Chicago, Illinois.

The Editorial Board of the **Radiologic Review** announces that this publication will now be known as the **Mississippi Valley Medical Journal.** Since 1936 this journal has been the official publication of the Mississippi Valley Medical Society, and it, therefore, seemed fitting that the name should be changed. The same editorial board, however, will be retained and the journal will continue its original purpose to be a general practitioner's periodical. It will be devoted to the progress of clinical medicine, surgery, and radiology as they interest the practising physician and surgeon.

The March issue of this journal, which has just been received, is the Twelfth Annual Radium Number and contains ten articles written by well-known American radiologists for the man in general practice.

The **American Physicians' Art Association** will hold its second Art Exhibit in the City Art Museum of St. Louis, Missouri, May 14 to 20, 1939, during the annual session of the American Medical Association. Art pieces will be accepted for this Exhibit in the following classifications: (1) oils, both portrait and landscape; (2) water colors; (3) sculpture; (4) photographic art; (5) etchings; (6) ceramics; (7) pastels; (8) charcoal drawings; (9) book binding; (10) wood carving; (11) metal work (jewelry). There will be over sixty valuable prize awards. Information in regard to membership in this Association and rules of the Exhibit may be obtained from the Secretary, Dr. Max Thorek, 850 Irving Park Boulevard, Chicago, Illinois, or from the President, Dr. F. H. Redewill, 521 Flood Building, San Francisco, California.

At a recent meeting of the Executive Committee of the **British Orthopaedic Association,** the following orthopaedic surgeons were elected to Associate Membership:

Mr. S. R. Chandra, P. O. Uluberia, District Howrah, Bengal, India.
Mr. Alford Dorman, The Royal Hospital, West Street, Sheffield I.
Mr. E. W. Knowles, 96 St. George's Road, Wallasey, Cheshire.
Mr. W. R. D. Mitchell, 44 Belvidere Road, Princes Park, Liverpool.
Mr. G. C. Sen, 37 Gawirbari Lane, *Calcutta, India.*
Mr. G. M. Sleggs, Burton House, Kent's Bank Road, Grange-over-Sands.
Mr. J. V. Todd, Tyneville, Brackenville, Darlington.

The following surgeons were elected to Full Membership:

Mr. F. G. Allan, 25 Calthorpe Road, Five Ways, Birmingham.
Mr. H. J. Burrows, 23 Park Crescent, Portland Place, London, W. 1.

The following Honorary Member was also elected:

The Right Hon. The Viscount Nuffield, Nuffield Place, Nr. Henley-on-Thames.

At the **Réunion d'Orthopédie et de Chirurgie de l'Appareil Moteur de Bordeaux**, held on November 9, 1938, under the Presidency of Dr. Charles Lasserre, the following program was presented:

Intertrochanteric Osteotomy—Dr. Charles Lasserre, Bordeaux.
Fracture of the Patella with Considerable Displacement of the Fragments: The Use of a Fascia Lata Graft—Dr. Charles Lasserre, Bordeaux.
Treatment of Diaphyseal Fractures of Both Bones of the Forearm by the Open Osteosynthesis of Ombrédanne—Dr. Ath. Contargyris, Greece.
Kirschner-Wire Treatment of Fractures of the Femur—Dr. R. Barroux, Bordeaux.
Madelung's Deformity—Prof. H. L. Roeher, Bordeaux.
Bilateral Dislocation of the Hip and Fracture of the Femoral Diaphysis—Dr. Laumonier, Bordeaux.
Scoliosis Following Thoracoplasty—Dr. Charrier and Dr. Loubat, Bordeaux.
Subtrochanteric Osteotomies—Dr. R. Guérin, Bordeaux.
Tarsal Scaphoiditis and Tuberculosis—Dr. Raymond Moulafe, Toulouse.

Dr. Lasserre presented a case in which intertrochanteric osteotomy was employed. He called attention to the fact that he had used this procedure in preference to oblique subtrochanteric osteotomy in cases of adolescent coxa vara and in cases of instability. It is interesting to note that this type of osteotomy was first performed by Rhea Barton in Philadelphia in 1826.

The Fourth World Conference of Workers for Cripples is to be held in London, at Bedford College, from July 16 to 22, 1939, under the auspices of the Central Council for the Care of Cripples. Three subjects have been selected for discussion. (1) Preventive Orthopaedics in Childhood; (2) The Education, Vocational Training, and Subsequent Employment of the Crippled Child; (3) The Industrial Cripple. The principal speakers on the first topic will be Mr. R. C. Elmslie, F.R.C.S., of London, Chairman of the Executive Committee of the Central Council for the Care of Cripples; Mlle. Marcelle Dantzig, of Chateauroux, France; and a representative from Canada. The second subject will be presented by Mr. C. W. Maudsley, C.B., of London; Dr. M. Bartos, of the Jedlicka Institution for Crippled Children, Prague; and Dr. Paul Guldal, of Copenhagen. Discussion on the third topic will be opened by a member of the staff of the International Labour Office, which has an immense amount of material at its disposal relating to every country in the world, and the other speakers will be Dr. Lauterbach, Director of the National Federation of Industrial Vocational Association, Berlin, and Mr. John A. Kratz, Chief of the Bureau of Vocational Rehabilitation, Washington. An interesting program of discussions and visits to institutions and other places of interest has been planned. Further information may be obtained from the Organising Secretary, 34, Eccleston Square, London, S.W. 1.

The Twenty-Ninth Congress of the **Società Italiana di Ortopedia e Traumatologia** was held in Rome on October 17 and 18, 1938. The Congress was opened by the President, Prof. Riccardo Dalla Vedova, who outlined the development of orthopaedic and traumatic surgery in Italy from its beginning in 1891 to the present. Following this address, His Excellency DeMarsanich, Under-Secretary of State for the Ministry of Communications, emphasized the growing importance of orthopaedic and traumatic surgery.

The first part of the program was devoted to a discussion of "Poliomyelitis". Prof. Sandro Marconi, of Venice, gave a résumé of the methods of treatment of poliomyelitis in Italy, outlining the means used in both the early and later phases of the disease. His suggestions for the proper care and treatment of patients with poliomyelitis were later summarized by Prof. Edoardo Calandra, of Palermo, as follows:

1. A stay of about twenty days in a paediatric clinic or section of a hospit infectious ward.

2. Obligatory transfer of the patients to orthopaedic centers conveniently

3. Study and orthopaedic treatment of the patients with at least six m hospitalization.

4. Eight or nine years of treatment and ambulatory care, with monthly or at l bi-monthly visits to the orthopaedic center.

5. Where necessary, surgical interventions at the age of eight or nine years, wi an additional period of hospitalization.

6. Postoperative care up to at least twelve years of age.

Prof. Luigi Baj, of Turin, described the orthopaedic methods in use at the *Ospedale Maria Vittoria*, and Dr. Alfredo Campiglio, of Mezzaselva, reported on the organization of orthopaedic assistance for poliomyclitic patients in the Province of Vincenza.

Prof. Demetrio Bargellini, of Milan, urged the need for a better coordination of the existing hospitals and establishments, and suggested courses for surgeons under whose care poliomyelitic patients might come.

Prof. Edoardo Calandra, of Palermo, suggested as a possible treatment of cerebral paralysis the division and immediate suture of nerves. The discussion on this paper was for the most part unfavorable.

Dr. Siro Luigi Carnevalli, of Milan, discussed the functional re-education of poliomyelitic patients, using as an example the work school instituted by Prof. Riccardo Galeazzi.

Papers on various methods of muscle re-education, muscle transplantations, bone lengthening, bone blocks, appliances for joint deformities, and the use of warm salt-water pools were presented by the following: Prof. Angelo Lavermicocca, of Turin; Dr. Francesco Mandruzzato, of Brescia; Prof. Carlo Marino-Zuco, of Rome; Prof. Pasquale Del Torto, of Naples; Dr. Spartaco Seheggi, of Ancona; Dr. Sannio Bravetti, of Venice.

The second portion of the program consisted of a symposium on "The Surgical Treatment of Osteo-Arthritis Deformans of the Hip". Prof. Dario Maragliano and Dr. Gino Picetti, of Genoa, opened the discussion. They stated that in the majority of cases three phases can be distinguished: the pre-arthritic, the initial, and the deforming. Surgery should not only aim to cure but also to prevent the changes which occur. Preventive surgery, according to these authors, includes: (1) drilling the neck and head of the femur, with or without insertion of a graft, as in infantile osteochondritis; (2) various operative procedures in coxa vara, such as osteotomies and displacement downward of the greater trochanter or resection of the pathological zone in the neck; (3) reconstruction of the roof of the acetabulum. Under the category of curative surgery, the authors considered the following: (1) transposition of the hip; (2) drilling and grafting of the neck and head; (3) osteotomies; (4) reconstruction of the roof of the acetabulum; (5) resection of the joint and arthroplasty; (6) arthrodesis. From their studies of the early and late results, these authors came to the following conclusions:

1. Surgery has given improvement in some cases as far as pain and the ability to walk are concerned.

2. In the less severe cases, surgery is not advisable.

3. Of the various procedures advocated, drilling or drilling and grafting are the only methods leaving the configuration of the hip intact.

4. Drilling gives better results than might be expected.

5. Reconstruction of the roof of the acetabulum is likely to be disappointing and, in addition, a subtrochanteric osteotomy may be required.

6. Subtrochanteric ostcotomy is the method of choice in cases where there is some mobility still present without much pain and also where there is either a definite subluxation or luxation.

7. In adults and in the aged with an advanced and painful stage of unilateral osteoarthritis, arthrodesis gives the best results, provided the knee function is good.

8. As a rule, modelling resection and arthroplastics have not yielded good results.

Prof. Riccardo Galeazzi, of Milan, discussed the paper by Prof. Maragliano and Dr. Picetti and stated that he agreed for the most part with their findings, but that he believed operative intervention should be done early. He reported very satisfactory results from osteotomies done by the method of Pauwels.

The other subjects included in this symposium were as follows:

Subtrochanteric Osteotomy in Osteo-Arthritis Deformans of the Hip—Dr. Andrea Albanese and Dr. Aldo Arienti, of Milan.

Clinical and Statistical Results of Surgical Treatment of Osteo-Arthritis Deformans of the Hip—Prof. Luigi Baj, of Turin; Prof. Demetrio Bargellini, of Milan; Prof. Calogero Casuccio, of Bologna; Prof. Raffaele Zanoli, of Pietraligure; Dr. Carlo Giorgi, of Venice.

Treatment of Osteo-Arthritis of Mechanical Origin—Prof. Ugo Camera, of Turin.

Arthroplasties of the Hip for Osteo-Arthritis Deformans—Prof. Mario Camurati, of Ancona.

Arthrodesis in the Treatment of Osteo-Arthritis Deformans—Prof. Francesco Delitala, of Venice.

Bilateral Ankylosis of the Hip in Osteo-Arthritis Deformans—Prof. Carlo Marino-Zuco, of Rome.

Arthritis Deformans and Congenital Dislocation of the Hip—Prof. Mastromarino and Prof. Miglierina.

Drilling of the Head and Neck of the Femur in Osteo-Arthritis Deformans of the Hip—Prof. Antonio Poli, of Milan; Prof. Salvatore Rollo, of Naples.

Arthritis Deformans of the Hip and Congenital Anomalies—Dr. Guglielmo de Lucchi.

The third and last portion of the program was given up to a large number of interesting miscellaneous case reports by the following: Dr. Giuseppe Cabras, of Venice; Dr. Myriam Ciancio, of Rome; Prof. Nicola Franceschelli, of Rome; Dr. Gastone Galluzzi, of Venice; Prof. Alessandro Guaccero, of Bari; Dr. G. Mancini, of Bologna; Prof. Renato Memmi, of Rome; Dr. Carlo Re and Dr. Pietro Calvetti, of Turin; Prof. Giuseppe Rinonapoli, of Pietraligure; Dr. Francesco Russo, of Rome; Dr. Mario Soncini, of Rome; Prof. Giuseppe Tancredi, of Rome; Prof. Ulisse Vignolo, of Genoa; Dr. Vincenzo Catoni, of Rome; Dr. Renato Morganti, of Bologna; and Dr. Giuseppe Pedroli, of Rome.

Current Literature

THE TREATMENT OF FRACTURES. Ed. 11. Charles Locke Scudder, A.B., Ph.B., M.D., F.A.C.S. Philadelphia and London, W. B. Saunders Co., 1938. $12.00.

Scudder's first edition of a book on fractures appeared in 1900 and was one of the first books to deal exclusively with this subject. Since that time new editions have appeared regularly and the subject matter has been constantly altered to keep up with current practices. After thirty-eight years comes the masterpiece, a book larger and finer than ever, but still reflecting the author's constant study of new and better methods.

Fifteen chapters of this new work have been written by other physicians who are more actively engaged in the treatment of fractures. These men have been selected by the author from various clinics in Boston and elsewhere because of outstanding contributions to their subject. Obsolete methods of treatment have been deleted, and only those procedures which have proved to be of value have been given a place in this book.

Scudder is a believer in fundamentals; he has tried to emphasize the fundamentals in the causation of the fracture, in its reduction, and in the maintenance of the fragments in position after reduction. He points out that individual fractures may be treated by a variety of methods and that a physician well grounded in sound fundamentals must use his own thought and common sense in treating the individual.

Hampton, a roentgenologist, describes the proper procedures to be used in the reduction of fractures under fluoroscopic control, with due warning as to its possible dangers. The author then discusses traction treatment by fixed traction and by weight or mobile traction and describes the apparatus used. He considers skeletal traction the most efficient method, but mentions the disadvantages as well as the merits. Careful instructions are given as to the sites and technique for the application of skeletal traction and for the later removal of the apparatus.

Thorndike has written an excellent chapter on "Birth Fractures", based on a series of 115 cases. There were no cases of true intra-uterine fractures. The three important factors in the production of birth fractures are the type of presentation, the type of delivery, and the size and weight of the baby. The special methods and apparatus required are illustrated.

Aitken writes on "Epiphyseal Injuries", a subject considered of much importance in recent years. He describes three types of epiphyseal injuries: (1) those in which the entire epiphysis is displaced *en masse* and the resulting deformity is slight if reduction is accomplished; (2) those in which the fracture line crosses the bony epiphysis, in which case there may be a resulting change in the growth rate; and (3) those in which the injury is from a crushing force with resulting early closure of the epiphyseal line and marked deformity.

Special chapters deal with transportation of the injured patient, the preparation of and the use of plaster bandages, massage, mobilization, the healing of fractures, anaesthesia, pathological fractures, and compound fractures.

Perhaps the most interesting chapters are those by Scudder on the operative treatment of fractures, the selection of the proper cases for operation, the qualifications of the operator, operative technique, and the surgical approaches to the bones. The latter half of the book is made up of a detailed, well-illustrated discussion of fractures by special regions. Rogers has given an excellent treatise on fractures and dislocations of the vertebral column and Kazanjian and Thoma an equally valuable one on fractures of the facial bones.

The excellent points in this new edition are far too numerous to point out. Particular mention should be made of the very fine drawings and illustrations and of the attractive appearance of the book. Scudder's "The Treatment of Fractures" will still maintain its original popularity among surgeons, physicians, and students.

PRAKTISCHE ANATOMIE. EIN LEHR- UND HILFSBUCH DER ANATOMISCHEN GRUNDLAGEN ÄRZTLICHEN HANDELNS. 1. Band, 4. Teil. BEIN UND STATIK. (A Textbook of the Anatomical Rudiments of Surgical Treatment. Vol. I, Part 4. The Leg and Statics.) T. von Lanz und W. Wachsmuth. Berlin, Julius Springer, 1938. 49 marks.

Julius Springer has now published Part 4 of Volume I of "Practical Anatomy" by von Lanz and Wachsmuth, which deals with the anatomy of the leg. This book is equal in character of the text, quality of the illustrations, and completeness of the treatment to the previous parts of this comprehensive work.

The leg is studied in every detail, beginning with the contour and including fascia, muscles, tendons, nerves, vascular system, and bony framework. Each structure is considered separately and in relation to the surrounding parts. In this way the reader is given a clear picture of the composition of each part and its relation to the other components of the leg.

The surgical anatomy of the leg as a whole is discussed, as well as the various regions which have special significance surgically,—the popliteal space, and several regions of the thigh, the groin, and the foot. The dissections of these regions are particularly useful in delineating accurately the position and relation of the structures, familiarity with which is essential in surgical procedures.

The anatomy of the joints is described in detail, as well as the normal movement and function, including the control exercised by the muscles. Special attention is given to the muscles and, in addition to a discussion of their normal function, their action in producing deformity in fractures is considered.

Three hundred and forty-two excellent roentgenograms and drawings are so placed throughout the book that the reader can conveniently compare them with the text. Most of the drawings are in color, thus affording a particularly clear conception of the surgical relation of the different structures.

The foot-notes and references to the literature are included in a section following the text, and a very full index of subject matter and illustrations concludes the volume.

This book establishes a standard of thoroughness, completeness, and clarity of presentation which would be difficult to surpass. As a reference book it will be found invaluable.

ROENTGEN DIAGNOSIS OF THE EXTREMITIES AND SPINE. (Annals of Roentgenology, Vol. XVII.) Albert B. Ferguson, M.D. New York, Paul B. Hoeber, Inc., 1939. $12.00.

This volume, the seventeenth in the Series of Monographic Atlases of Annals of Roentgenology, will be particularly welcome, for Dr. Ferguson, Director of Roentgenology at the New York Orthopaedic Hospital, has given much from his wealth of experience and extensive knowledge of roentgenology, particularly of the interpretation of the appearances which are disclosed in the roentgenogram.

Dr. Ferguson states that he has confined this volume to the presentation and discussion of material of diagnostic utility. From the mass of material available in the files of the New York Orthopaedic Hospital, he has been able to select illustrative cases in which the diagnosis has been established at operation, at autopsy, or through continued clinical observation over long periods of time. As a still further aid to the student, the roentgenograms are accompanied in many instances by case histories, which demonstrate the basis of diagnosis and the pertinent facts.

In his introduction, Dr. Ferguson stresses the difference between roentgenographic description and diagnostic description and states that the latter "should note the *characteristic* traits, features, or appearances which are *essential* to differentiate the lesion which *is* present from those that *might be* present and should list those traits in an orderly manner, leading to a logical diagnostic conclusion". With this definition as his starting point, he proceeds to the study and interpretation of injuries, diseases, and deformities of the extremities and the spine.

The different structures of bone, with the inherent disturbances in are first discussed. Then follow chapters on cartilage lines, fracture lines fractures and the healing of fractures; epiphyses and small bone masses; sues; the arthritides, including tuberculous arthritis and non-tubercu arthritis; and the concluding chapter is devoted to the spine. Each conditi with a simplicity and clarity that greatly facilitates the understanding of the factors which form the basis of intelligent interpretation of the roentgenog

The book is profusely illustrated with 512 excellent roentgenograms, a by concise legends pointing out the changes from the normal appearance and icance.

In spite of its rapid advance in recent years, roentgenology is still in its During its rapid development, particularly in its mechanical efficiency, knowled relative value of the abnormalities shown and the application of the roentgen evidence to clinical observation has, in general, not kept pace with the interpreta understanding of the pathological significance of its disclosures. This is shown conflict which sometimes exists between the roentgenographic findings and the int tation of the clinical signs and symptoms. The medical world is indeed fortuna having a man like Dr. Ferguson, with extensive experience and a fund of informa who recognizes the need of correlating the roentgenographic and clinical findings, who is directing the study in his Department toward a more truthful and, in consequen more scientific interpretation of the information made available by this branch medicine.

This book should be influential in raising the standard of this most important of the newer means of diagnosis, and should be studied by all who are called upon to determine abnormalities and pathological conditions in bone.

DIE ORTHOPÄDISCHE WELTLITERATUR. Edited by Prof. Dr. August Blencke and Prof. Dr. Hermann Gocht. Ergänzungsband 1931–1935. Compiled by Dr. Erich Witte. Stuttgart, Ferdinand Enke, 1938. 134 marks. (A discount of 25 per cent. is offered to purchasers outside of Germany.)

This supplementary volume to the two which were published in 1936 under the auspices of the *Deutsche Orthopädische Gesellschaft* and the *Deutsche Vereinigung für Krüppelfürsorge* has been compiled by Dr. Erich Witte, Librarian of the *Orthopädische Universitäts-Klinik* of Leipzig, and includes the orthopaedic literature which has appeared throughout the world during the period 1931–1935.

The same plan of indexing the references that was employed in the first two volumes has been followed in this one,—namely, the literature has been divided into groups, and the references are indexed alphabetically according to the names of the authors under these groups. The system of grouping has been revised somewhat, so that there are more divisions and each is less comprehensive. The present grouping is as follows:

1. Textbooks and Works of General Orthopaedic Interest;
2. Orthopaedic Apparatus and Shoes;
3. Bloodless Interference in the Treatment of Deformities;
4. Massage, Medical Gymnastics, Physiotherapy, and Bodily Exercise;
5. Congenital Diseases and Deformities;
6. Acquired Diseases and Deformities;
7. Deformities and Affections of the Skull and Neck;
8. Deformities and Diseases of the Thorax and Shoulder Girdle;
9. Posture, Malposture, Scoliosis, and Kyphosis;
10. Tuberculous Spondylitis;
11. Other Deformities and Affections of the Spine, Back Pain, and Lumbago;
12. Deformities and Affections of the Upper Extremity;
13. Deformities and Diseases of the Pelvis and Ischium;
14. So-Called Congenital Dislocation of the Hip;

15. Tuberculous Coxitis and Its Sequelae;
16. Coxa Vara, Coxa Valga, Malum Coxae, and Other Deformities and Affections of the Hip;
17. Genu Valgum, Genu Varum, and Genu Recurvatum;
18. Deformities and Affections of the Thigh, Lower Leg, and Knee Joint;
19. Metatarsus Varus and Club-Foot;
20. Flat-Foot, Incomplete Flat-Foot, and Spread-Foot;
21. Other Diseases and Deformities of the Ankle Joint, the Foot, and the Toes.

Following the references is a general index of the subject matter in alphabetical order; and the book closes with a list of corrections, which, because of the magnitude of the task of assembling this mass of information, seem inevitable.

As was true of the other two volumes, a perusal of the English references, in particular, reveals many inaccuracies in titles and errors in spelling, but, as Dr. Schede has pointed out in his Foreword, he and his colleagues of the *Deutsche Orthopädische Gesellschaft* who have been entrusted with the preparation of this volume are busy physicians and not professional bibliographers. Therefore, this work cannot be recommended as the final authority for the person engaged in preparing an accurate bibliography, but it can be heartily endorsed as an efficient guide to what has been published on the many phases of orthopaedic surgery.

LE TRAITEMENT NON SANGLANT DES FRACTURES DU RACHIS (Non-Operative Treatment of Fractures of the Spine). Pierre Mallet-Guy. Préface du Prof. R. Leriche. Paris, Masson et Cie, 1938. 40 francs.

In his Preface, Prof. Leriche emphasizes the fact that, since the publication of the hyperextension method of treatment of fractures of the spine, many surgeons with insufficient experience have practised modifications of the principle, and he stresses the need of accurate information to guide in the diagnosis and treatment.

The book is based on the author's experience in treating thirty-four cases of fracture of the spine over a five-year period, and it takes up consecutively the general problems of the present-day non-operative treatment of fractures of the spine, the technique and principles of reduction of the deformity, the means of retention, and the methods used in the later treatment to preserve and to develop mobility and strength. The author considers the various fractures which are usual in the three regions of the spinal column with reference to the character of the trauma, the type of fracture, and the significance of the location. The discussion of the types of fracture is especially well illustrated by roentgenograms and line drawings, demonstrating accurately the disposition of the fragments. As would be expected today, attention is directed to the part played by the nucleus pulposus in the production of these lesions. The complications and sequelae of this group of injuries are discussed, and the results of treatment are analyzed both from the neurological and the orthopaedic points of view.

The author has given rather more attention than is usual in a small volume to the treatment directed toward functional return to normal activity, and he emphasizes the need of early treatment (when practical), followed by a thorough regimen of exercise to accomplish this end. It is satisfying to find this part of the treatment presented with such care and in so much detail. The exercises used by the author are illustrated by moving-picture films, showing the patients in action.

This simple and graphic presentation of the results of the author's painstaking study of his series of cases will be of definite aid to those who have to treat these injuries.

THE FUNDAMENTALS OF ORTHOPAEDIC SURGERY. Prof. S. L. Tregubov. Moscow and Leningrad, State Medical Publication, 1938. 7 rubles.

This is truly a textbook of the fundamentals of orthopaedic surgery and is based on a course of lectures given at the Kharkov Medical Institute. The material is divided into three sections. The first deals with general principles (including the anatomy and phys-

iology of motion), examination of patients, and various types of established orthopaedic treatments. The second section is devoted to contracture, ankylosis, congenital deformities, poliomyelitic and spastic paralyses, arthropathies, arthritides, osteochondropathies, and, in general, to all the afflictions which can be included under the classification of orthopaedic surgery A large part of this section is given to tuberculosis of bones and joints, a subject in which the author has had an extensive personal experience The third section on fractures and dislocations is written by Dr. A. V. Taft, an old associate of Prof. Tiegubov's

The book is written in a very clear and easy style, and the illustrations are good. One notices that there is no mention of bone tumors or of acute infection of bones and joints The epiphysiolysis of the hip joint is not described. In the section on fractures of the neck of the femur, open operation or use of wires and nails is not given. However, these omissions do not affect the excellence of the book There is a good bibliography of the Russian literature on various orthopaedic problems and of the foreign literature available in Russia.

Die Ätiologie der Huftgelenkdeformitaten. Die Varusdeformitat ein organisatorischer Effekt statisch-dynamischer Krafte. (The Etiology of the Hip Deformities Coxa Vara as an Expression of Static-Dynamic Forces) Dr Anton Stauss. (Beilageheft zur Zeitschrift fur Orthopadie LXVIII. Band.) Stuttgart, Ferdinand Enke, 1938 10 marks.

Congenital coxa vara is well reviewed in the first chapter. Excellent examples serve to illustrate the vertical direction of the epiphyseal plate and the flattening of the acetabulum, which distinguish this from the adolescent form. In the consideration of the latter it is first necessary to exclude the occurrence of deformity secondary to rickets, osteomalacia, chondrodystrophia foetalis, osteitis fibrosa, and the "*Umbau*" zones of Looser. There remains an anatomically designated deformity which is undoubtedly the result of a growth disturbance. Dr. Stauss finds that this idiopathic adolescent coxa vara develops as the biological product of forces which are explained by Roux's law. The same laws of static explain the shape of the proximal end of the femur in coxa valga and the so-called congenital dislocation of the hip. The deciding factor seems to be the slight developmental variation in the structure of the hip, in which the writer has very little interest. The second half of the 140-page monograph is devoted to a résumé of the work of Fischer and Pauwels, and to an involved elaboration of their studies of the static-dynamic function of the hip joint. If one follows the intricacies of the writer's computations, one is presumably in a better position to understand the tremendous stresses and strains involved. One is more likely, however, to admit the significance of the static and dynamic forces, skip this portion, and return to ponder the "slight developmental abnormalities"

Oh, Doctor! My Feet! Dudley J. Morton, M.D. New York and London, D Appleton-Century Co., Inc , 1939. $1.50.

The need for the presentation of a sensible clarification of current non-professional ideas on the subject of the feet is apparent to everyone who is at all familiar with the matter. Therefore, one may recommend this little book of Dr. Morton's, which he has written for this purpose, without necessarily subscribing to a good deal that he claims to be the cause of the group of complaints which sufferers from foot troubles bring to their family physicians and their orthopaedic consultants. It is true that the shoe and drug stores have had forced upon them the treatment of these conditions to a very considerable extent, because, unfortunately, in the not so very distant past, too much importance was attached by the orthopaedic surgeon to the use of "arch supports". With a better understanding of the history of these cases and their behavior under treatment, far less stress is being laid upon mechanical supports and more and more emphasis is being placed upon rest and physical therapy. Many years ago the congenital variations in the length

of the metatarsals were pointed out by Dr. Thomas Dwight, and others since that time have indicated some of the bearings of these variations upon the causation of certain foot troubles that result when this type of foot is allowed to wear a ready-made shoe. As a result of this knowledge, the significance of the wearing of proper shoes has brought about a measurable improvement in the treatment of such conditions. The value of exercise in bringing relief to patients with symptoms of "flat-foot" or "weak-foot" cannot be easily brushed aside by those who have had any considerable experience in handling conditions of this sort. The book will serve a very good purpose, however, if it succeeds in bringing to the attention of sufferers from troublesome feet that there are methods of treatment capable of bringing them relief without resorting to shoe salesmen and drug clerks, who often seek to sell arch supports, which, in the modern conception of the etiology of these symptoms, may be entirely inappropriate unless supplemented by some curative line of treatment.

Untersuchungen über die Ätiologie und Pathogenese der angeborenen Hüftverrenkung. Eine röntgenologisch-erbklinische Studie. (Investigations of the Etiology and Pathogenesis of Congenital Dislocation of the Hip. A Roentgenographic Clinical-Genetic Study.) Alexander Fabel. Leipzig, Georg Thieme, 1938. 7.80 marks.

In opposition to the previous conception that the osseous changes in the developing hip are secondary to those of the cartilage, the writer maintains that the form is established by the predetermined shape of the bone elements. In support of this contention, by the injection of normal and dislocated hips with a contrast medium, he demonstrated the cartilage as well as the bone outlines in a series of roentgenograms. Disturbed ossification, particularly of the acetabular roof, is not the result of congenital dislocation, but is the basic cause of this condition. The joint cartilage, which is essentially normal in form to start with, is insufficiently reinforced by bone. When subjected to the ordinary functional demands, it may yield, with the appearance of deformity or dislocation.

The disturbed ossification is in the nature of an arrest of development. In a series of genetic studies, the writer has demonstrated that the tendency to dislocate is an irregular simple dominant, which is inherited according to Mendelian laws.

Consolidated Indices: 1903–1937. Springfield, Illinois, Charles C. Thomas, 1939. $12.50 in the United States, Latin America, and Canada; $13.00 in other countries.

Issued under the direction of the Publication Committee and the Editorial Office of the American Roentgen Ray Society, this index includes the original articles, editorials, biographical and historical sketches, and abstracts from foreign and domestic journals which have appeared in the Transactions of the American Roentgen Ray Society, the American Quarterly of Roentgenology, the American Journal of Roentgenology, and the American Journal of Roentgenology and Radium Therapy from 1903 to 1937. The task of compiling the mass of material from the 30,000 pages of these four publications has been entrusted to Dr. George H. Smith, who, within the space limitations imposed and in view of the many changes in format, pagination, spelling, etc., consequent to the different editorial policies, has been successful in constructing a remarkably uniform, comprehensive, and readily accessible index. In his chapter of introduction Dr. Smith calls attention to the fact that this period of almost thirty-five years coincides with the beginning and development of the science of roentgenology. Just as there have been changes in the technique, so have there been corresponding changes in the terminology. "Hence, a single technique or a single symptom-complex may be found under several entries, reflecting thus not only the wishes of the author and the choice of the editor, but also the usage of different periods."

The authors' index contains 22,500 entries and is arranged so that original articles and abstracts appear as far as possible in chronological order under the name of the author.

The subject index comprises 160,000 entries. In the case of an abstract, the index does not refer the reader directly to the journal in which the article originally appeared, but to the issue in which it was abstracted; therefore, this index cannot be used independently as a reference book of roentgenological publications for this period. However, as a guide to roentgenological literature throughout the world from the inception of this science to its present state of development, it should be of great value. Dr. Smith states that he has not attempted to include a complete cross reference of subjects, as this would far exceed the limits of the present volume, and closes with a word of warning that might be applicable to almost any undertaking of the present day: "The user must, therefore, be prepared to supply that measure of intelligence requisite to make of the Index a tool of maximum effectiveness."

LES TRAITEMENTS ORTHOPÉDIQUES ET CHIRURGICAUX DES RHEUMATISMES CHRONIQUES (Surgical and Orthopaedic Treatment of Chronic Rheumatism). René Simon. Paris, Gaston Doin & Cie., 1938. 35 francs.

This pocket-size volume is one of a series dedicated to a practical discussion of medical topics. Since the text is concerned mainly with therapeutic practice, there is little discussion of any of the other phases of the subject. The work is divided into three parts. The first is concerned with the purely non-operative therapy. The approach to the problem, the types of splints and braces recommended, and the means used to prevent or to correct deformity are patterned closely upon those familiar to American workers. While practically all the procedures commonly used are mentioned and many are described in detail, the indications for the use of the particular method and a critique of the method advocated are sadly lacking.

In the second part of the work surgical methods for modifying the course of the disease are discussed. These include drilling, operations on the sympathetic nerve, and various operations on the thyroid-parathyroid apparatus. The last-mentioned subject is handled in considerable detail and with a degree of sympathetic understanding that indicates the author's especial interest in the subject.

As a means of affording a rapid survey of the field, for its bibliography of the French contributions to the literature on rheumatism, and for the expression of a hopeful attitude in respect to an all too depressing condition, the volume may be considered a useful addition to the orthopaedic surgeon's library.

RICHTLINIEN PRAKTISHER ORTHOPÄDIE (Guiding Elements of Practical Orthopaedic Surgery). Dr. Albert Lorenz. Vienna, Franz Deuticke, 1939. 16.80 marks.

This book, dedicated to the author's father, Dr. Adolf Lorenz, differs somewhat from the usual texts on orthopaedic surgery. It is not intended for beginners, nor does it contain special technical descriptions. The author states that the greater part of the book was written in New York and that the American and British literature was given especial consideration. However, the book is based distinctly on the author's personal views and beliefs.

The material is divided into thirty-five separate articles, dealing with the most important questions of orthopaedic surgery. These articles are not classified in a customary manner: they have the appearance of monographs and follow a certain, although not very strict, systematic sequence. Articles on various affections of the spine, for instance, are followed by hip affections, etc. On the other hand, an article on anaesthesia in orthopaedic surgery is followed immediately by an article on arthritis deformans; a discussion of Sprengel's deformity is preceded by a section on tuberculosis of the smaller joints and followed by an article on club-foot.

There is a wealth of interesting material in the 455 pages of this book. It is presented in a fashion that gives it an almost encyclopaedic character with an abundance of names and historical references. Any orthopaedic surgeon who can read German will

find many interesting facts concerning the practice and points of view of his German-speaking colleagues, as compared with methods described by American orthopaedic surgeons and interpreted by the author.

DISEASES OF THE NOSE, THROAT AND EAR. W. Wallace Morrison, M.D. Philadelphia, W. B. Saunders Co., 1938. $5.50.

The material upon which this book is based has been collected during fifteen years of post-graduate teaching. Its style of presentation is brief and pleasantly original. The author emphasizes the importance of exercising the same care in history taking and physical examination in otolaryngology as in general medicine.

The book comprises forty chapters, only eight of which are devoted to aural diseases. Especially interesting sections deal with nasal allergy, chronic sinusitis, osteomyelitis, and the rôle of the sinus as a source of infection.

In discussing nasal allergy, it is emphasized that many failures in sinus surgery arise from lack of recognition of underlying hypersensitivity.

From four to eight weeks of conservative nasal treatment are advocated before any elective surgical attack is made upon chronic sinusitis. In trying to establish this principle, Dr. Morrison makes it clear that it is usually *all* the treatment necessary in children, and is the only therapy that can be applied in treating the aged and those suffering from severe cardiac, renal, and hepatic disease, advanced hypertension, hemophilia, active syphilis, and tuberculosis.

The section on osteomyelitis of the skull supports Mosher's principle of radical surgical treatment.

Dr. Morrison believes that sinuses or other foci may cause various diseases,—such as acute or chronic infectious arthritis, bursitis, tenosynovitis, myositis, and osteomyelitis.

Although this book is intended primarily for under-graduates and general practitioners, it contains much that will interest the orthopaedic surgeon.

DAS PANARITIUM. Dr. Max Saegesser. Berlin, Julius Springer, 1938. 4.80 marks.

By the term "*Panaritium*" is meant every non-specific infection of the hand and fingers which occurs in connection with closed wounds. As a rule, one deals with very trivial injuries, which heal rapidly on the surface, while in the deeper structures the process of inflammation continues, often unnoticed.

In the treatment of such infections, the writer emphasizes three important principles: (1) early and adequate opening of the inflamed area; (2) provision for unobstructed drainage; (3) complete and uninterrupted immobilization of the affected structures, as long as any acute manifestations of inflammation are demonstrable.

Descriptions are given of the different types of infection which may occur, together with the regions which may be involved primarily or by extension of the disease process. These are supplemented by numerous diagrams, illustrating the location of the infection and the site where the operative approach must be made. Immediate postoperative care of the wound, measures for combating systemic effects, and methods of restoration of function are discussed.

This book is worthy of study by anyone who is confronted with the problems that arise in the treatment of such infections.

A MANUAL OF FRACTURES AND DISLOCATIONS. Barbara Bartlett Stimson, M.D., Med. Sc. D., F.A.C.S. Philadelphia, Lea & Febiger, 1939. $2.75.

Most medical handbooks and manuals make dull reading. The type is usually fine; illustrations are sparse or lacking; and the subject is covered in a compendium fashion more likely to lull the student to sleep than to teach him. This "Manual of Fractures and Dislocations" is of an extremely convenient size. The format of the book

is excellent. The frequent line drawings clearly illustrate the text. The description of each type of fracture is taken up in orderly fashion under the headings of "Occurrence", "Displacement", "Diagnosis", "Pathology", "Treatment", "Time of Immobilization", "Prognosis", and "Summary". Perusal of this manual will obviously not equip the physician to treat fractures, particularly of the complicated type, but it does give the student a reference work of such size that it can be read in its entirety, furnishing an adequate groundwork of information which can be supplemented by reference to the more detailed textbooks of fractures and dislocations. It is quite the best small textbook on fractures which has come to the attention of this reviewer.

VERHANDLUNGEN DER VEREINIGUNG DER ORTHOPÄDEN WIENS (Proceedings of the Orthopaedic Society of Vienna). Edited by Dozent Dr. O. Strocker. Stuttgart, Ferdinand Enke, 1938. 8.20 marks.

This is a résumé of the papers presented at the meeting of the Orthopaedic Society of Vienna in December 1937.

The first day was devoted to a discussion of poliomyelitis. This began with a paper by Spitzy on surgical procedures performed for paralyses, in which he stressed particularly the need of a special institution for the care of children seriously crippled by poliomyelitis. Erlacher discussed the early treatment of poliomyelitis. He found that about 50 per cent. of the patients recovered without paralysis. Nothing new was suggested in regard to the early therapy of this disease. In the discussion of underwater gymnastics for poliomyelitis Sellner advised much more strenuous exercises than are commonly given in America. Horstenegg reported upon twenty-six patients following a bone-block operation to prevent plantar flexion of the foot, stating that he had obtained good results with various procedures, but that he preferred the operation of Camera.

On the second day a number of interesting cases were presented. New operative procedures were described, none of which seemed as satisfactory as the older operative techniques.

THE FUNCTIONS OF HUMAN VOLUNTARY MUSCLES. Norman D. Royle, M.D., Ch.M., F.R.A.C.S. Sydney and London, Angus & Robertson Limited, 1938. 3 shillings, sixpence.

In comparison with familiar textbooks of kinesiology, this Australian monograph is a model of brevity and conciseness. Prof. Burkitt, in an appreciative preface, compliments the author on his observations. An introduction states the four methods of determining muscle function, and explains the principles of synergism, antagonism, and muscle tone. In no more than fifteen succeeding pages is summarized the entire gamut of action of the voluntary muscles of the body, adequately illustrated by nine simple line drawings. The book, which is a marvel of compression, should prove a boon to students and teachers of muscle function.

UNFALL UND KNOCHENGESCHWULST (Trauma and Bone Tumor). Dr. Hans Hellner. (Beihefte zur Monatsschrift für Unfallheilkunde und Versicherungsmedizin. Heft 25.) Berlin, Julius Springer, 1939. 4.80 marks.

In this monograph the author considers the relationship between trauma and the origin of bone tumors. The types of bone tumor which are discussed are multiple chondroma, osteogenic sarcoma, osteitis fibrosa, osteitis deformans, and myeloma. It is stated that the great majority of tumors are traceable to an embryonal tumor anlage. Attention is called to the difficulties of associating tumor formation with trauma, and emphasis is placed on the exacting conditions under which the origin of a tumor may be ascribed to injury. Trauma is not a factor in the causation of osteitis fibrosa, osteitis deformans, or myeloma, and is very rarely mentioned in the history of patients with osteogenic sarcoma.

THE SCIENCE AND ART OF JOINT MANIPULATION. VOL. I. THE EXTREMITIES. James Mennell, M.A., M.D., B.C. (Cantab.). Philadelphia, P. Blakiston's Son & Co. Inc., 1939. $4.50.

This volume from the pen of Dr. James Mennell will be of special interest to orthopaedic and traumatic surgeons, particularly at this period when so much attention is being paid to the treatment of certain conditions by manipulation. Dr. Mennell's long and very extensive experience and his close association with the best of England's medical and surgical profession, combined with his analytical study of the principles and the application of manipulation, have enabled him to speak with authority.

He has approached the subject from a purely scientific standpoint: in each case his discussion of a joint and the derangements which may occur in it is followed by a very lucid explanation of the application of manipulation to the particular condition in question. He strongly emphasizes the necessity of a clear understanding of the movements normal to a joint, and he stresses the importance of examining the character and range of motion in each joint before making a diagnosis, particularly with reference to the manipulative treatment which is to be used.

The book is divided into three portions: Part I, General Considerations; Part II, The Joints of the Upper Extremity; and Part III, The Joints of the Lower Extremity. In the last two portions, a section of each chapter is devoted to an exposition of the anatomy of the joint under discussion, and a particularly clear description is given both of the skeletal structure and of the soft parts, a knowledge of which is essential in making the diagnosis of those conditions for which manipulation can be employed and also in selecting the type of manipulation and the amount of force to be used. He states that the typical manipulations and the special "grips" are of value in the manipulation of all joints, for, although they vary with different technicians and individuals, they are alike in principle. As a rule, he has given but one method of manipulation or treatment of the joint for each condition, as he feels that this is the simplest and clearest way of illustrating the principles to be followed, but in so doing he is fully aware that there are others of equal value. He also adds a few necessary words of caution not only in regard to the proper selection of the manipulation, but also to the conditions under which the manipulation is applicable.

The book is particularly well illustrated with line drawings, photographs, and roentgenograms, showing the pathological conditions and the movements and special grips used by the manipulator.

This volume merits the careful study of all those interested in what today may be termed "manipulative surgery", and by this study it is hoped that many of the differences and misunderstandings which have existed and still exist will be cleared up.

SEPTISCHE OSTEOMYELITIS IM OS PUBIS (Septic Osteomyelitis of the Os Pubis). S. S. Krook. *Acta Chirurgica Scandinavica*, LXXXI, 221, 1938.

The writer summarizes thirty-two cases from the literature and adds three additional ones. The etiological statistics are variously tabulated. Of the individuals affected, the majority were over twenty years of age. Four of the thirty-five patients were between forty-one and fifty, and two between sixty-one and seventy years. Males were more frequently involved than females. In three of the females the condition developed following a difficult delivery. One case, at least, was a direct extension from an infected vaginal rupture.

The lesion healed in twenty-six cases. There were five deaths and four results were unknown. While the earlier writers advised prompt radical operation, Dr. Krook advises conservative treatment or simple incision, which sufficed in his cases.—*W. P. Blount, M.D., Milwaukee, Wisconsin.*

SOME CRANIAL CHANGES IN RECKLINGHAUSEN'S NEUROFIBROMATOSIS. Thomas Rosendal. *Acta Radiologica*, XIX, 373, 1938.

The author presents eight cases of neurofibromatosis, which exhibited the facial

hypertrophy with atrophy of the subjacent bones which he considers characteristic. The opinions expressed in the literature as to pathogenesis of these changes are discussed.
—*Henry Milch, M.D., New York, N. Y.*

Zur Frage der Wirbelsäulenveränderungen nach Tetanus (On the Question of Post-Tetanic Vertebral Changes). E. Feistmann-Lutterbeck. *Acta Radiologica*, XIX, 391, 1938.

Knowledge in regard to the non-tuberculous infections of the vertebral column has been greatly increased during recent years. Among these, the post-tetanic vertebral changes occupy a peculiar position, because, while they are associated with an infective process, they are probably traumatic, rather than infective, in origin. Characteristically, the middle and upper thoracic vertebrae are involved. In the young especially, the "post-tetanic kyphosis" may markedly resemble the picture of the adolescent kyphosis.

The fact of the peculiar localization of the process in the upper thoracic vertebrae leads the author to concur with Zuckschwerdt's opinion that the platyspondylisis and wedge formation are due to trauma and muscle contracture, rather than to the local effects of toxins or metastatic tetanus infection.

There appears to be a marked uncertainty as to the incidence of this condition, as estimates vary from 20 to 84 per cent. Of fourteen patients whom the author examined, only one (7 per cent.) showed post-tetanic vertebral changes which could be considered beyond the normal. This patient, a seven-year-old boy, showed an isolated flattening of the seventh cervical vertebra. The author is of the opinion that the incidence of the post-tetanic vertebral changes has been overestimated, and that in many cases a tetanic origin has been assumed, but not established. Greater attention should be given to these cases in order to solve this problem.—*Henry Milch, M.D., New York, N. Y.*

Notes on Myeloma. Jorgen Bichel and Paul Kirketerp. *Acta Radiologica*, XIX, 487, 1938.

The authors discuss the question of the nature of myeloma. They note that in general the myelomata are considered as multiple and manifestations of a diffuse myelomatosis. However, there are cases which have been considered as solitary myeloma. These naturally raise the question as to whether the cases with multiple lesions are to be considered as primarily multiple or as primarily solitary, with secondary spread and multiple metastatic localizations.

Of twenty-seven cases reported in the literature, the authors consider only two as definitely established and three as fairly certain, while the rest cannot be evaluated, because of the short period of observation or incomplete study.

In two of the authors' cases, which displayed all the characteristics of the so-called "solitary myeloma", sternal puncture revealed abnormally high plasma-cell counts, indicative of generalized myelomatosis. The authors suggest the advisability of doing sternal punctures in all cases of bone disease where the diagnosis is uncertain. It is apparent that from the point of view of therapy, as well as of prognosis, such information might be of the greatest importance.—*Henry Milch, M.D., New York, N. Y.*

Synovial Sarcomas in Serous Bursae and Tendon Sheaths. Louis Berger. *The American Journal of Cancer*, XXXIV, 501, 1938.

The author presents a detailed study of five cases of synovial sarcoma, all originating outside of articulations in serous bursae or tendon sheaths. Careful histological and cytological studies are presented, with a painstaking review of the literature in regard to the nature of normal synovial tissue and synovial fluid; and also of all reported cases of synovial neoplasms. In the author's opinion, study of the neoplasms contributes to an understanding of the nature of the normal structures concerned.

Four of the author's cases are described as fundamentally reticulo-histo-endotheliosarcomata from a strictly morphological viewpoint. The fifth case is considered to be a malignant xanthomatous giant-cell tumor, hitherto undescribed. It is felt that the histology of these tumors favors the view that synovial cells constitute an autonomous cell type with peculiar morphological and functional properties and that albuminoid substance resulting from desquamation of cells in normal synovial cavities plays a rôle in the formation of synovial fluid.

Critical review of the literature as well as of his own cases prompts the author to propose a rather elaborate classification of synovial tumors, benign and malignant, based on the morphological and functional characters of normal synovial membranes. These characters are: (1) essentially reticulo-histiocytic, (2) endothelial, (3) predominantly mucous.

Clinically the conclusion is reached that synovial sarcomata of serous bursae are highly malignant, and run a more rapid course than those of articulations. Death is generally due to pulmonary, occasionally to cerebral metastases. Definite cure is exceptional and may be obtained only by early amputation.

The article is illustrated profusely with histological drawings and offers an excellent bibliography.—*Grantley W. Taylor, M.D., Boston, Massachusetts.*

PRODUCTION OF PRIMARY BONE TUMORS (FIBROSARCOMA OF BONE) BY INTRAMEDULLARY INJECTION OF METHYLCHOLANTHRENE. Alexander Brunschwig. *The American Journal of Cancer*, XXXIV, 540, 1938.

The author reports further experiments in the attempt to produce primary bone tumors in rats by the intramedullary injection of methylcholanthrene.

The carcinogenic hydrocarbon was introduced into the femora or tibiae of thirty-three adult white rats of unknown genetic history. Tumors appeared in four of these rats in eight to twelve months. Histologically the tumors were fibrosarcomata of parosteal or central type, practically identical histologically with the central fibrosarcomata observed in man. No metastases were found at autopsy.—*Grantley W. Taylor, M.D., Boston, Massachusetts.*

RUPTURE OF THE SUPRASPINATUS. Ernest Amory Codman. *American Journal of Surgery*, XLII, 603, 1938.

This article by Codman should be appended to his book "The Shoulder". While it reviews some of the facts stated in the book, it is nevertheless a remarkably clear and concise description of shoulder disabilities, and must be thoroughly studied in order to be appreciated.

Eighteen conditions, symptoms, and signs which indicate complete rupture of the supraspinatus are described; these should be present within twenty-four hours after the accident. The typical patient is a laborer, over forty years old, with no symptoms in the shoulder prior to accident, but who, following injury, sustains immediate sharp brief pain. On the following night, there is loss of power in elevation of the arm, faulty shoulder rhythm, a tender point over the shoulder sulcus, and numbness at the insertion of the supraspinatus, which causes a jog, wince, or soft crepitus, and which disappears under the acromion when the arm is elevated and reappears when the arm descends. Roentgenographic examination is negative. Immediate suture and repair are advocated and described. The author also describes the proper position in which to place the shoulder on the operating table, so that a satisfactory suture can be done through a very small incision.

The incomplete ruptures are not a positive diagnosis in many instances. Some of the various signs described are absent. The various diagnoses that are often made in this condition are also discussed.—*Custis Lee Hall, M.D., Washington, D. C.*

COMPOUND FRACTURES OF THE ELBOW JOINT IN ADULTS. William R. Cubbins, James J. Callahan, and Carlo S. Scuderi. *American Journal of Surgery*, XLII, 627, 1938.

The authors describe three methods of treatment of compound fractures about the elbow joint. They use hook-screw traction, which is placed into the olecranon and which they find is satisfactory for skeletal traction upon the injured elbow. In using the screw through a deep olecranon process, the screw is directed upward and forward toward the coronoid in order to hold the fragments together. They feel that this screw has advantages over the use of Kirschner wire in treating fractures of the olecranon.

A method of repair of the olecranon fracture is described where the fragments are firmly united by silk suture.

The authors state that under their present method of treatment they have had clean wounds in 91 per cent. of their cases, regardless of the extent of injury. They also advocate the avoidance of force in mobilizing injured elbow joints and feel that slight malpositions do not seriously affect the result and that it takes at least a year to evaluate the end result.—*Custis Lee Hall, M.D., Washington, D. C.*

INJURIES TO THE CARPAL BONES WITH PARTICULAR REFERENCE TO THE CARPAL SCAPHOID. Francis B. MacMillan. *American Journal of Surgery*, XLII, 633, 1938.

The author follows the method of Böhler, with slight modifications, using either general or local anaesthesia. The wrist is immobilized in a position of slight dorsal flexion in a molded plaster-of-Paris splint. After fixation, use of the hand is advocated and the healing period is shortened. The average time from reduction to discharge of the patient with a fresh fracture of the navicular was ten weeks.

Cases of non-union are mentioned. Surgical removal of the fragment is not advised, but bone drilling, with immobilization for from ten to twelve weeks, usually gives excellent results.—*Custis Lee Hall, M.D., Washington, D. C.*

FRACTURES OF THE UPPER EXTREMITY OF THE FEMUR NECK AND TROCHANTER. W. Rogers Brewster. *American Journal of Surgery*, XLII, 662, 1938.

The author feels that intertrochanteric fractures and fractures of the neck should be treated by internal fixation, for which he uses the Martin two-screw method.

The cases forming the basis of the report are eighty in number, and the operations were performed by twelve surgeons. Very little information is given as to the time of union and percentage of healed fractures. The author feels that successful cases must be interpreted in terms of life expectancy even though non-union has resulted at the time of death.—*Custis Lee Hall, M.D., Washington, D. C.*

THE TRAUMATIC SHOULDER. WITH SPECIAL REFERENCE TO RUPTURE OF THE SUPRASPINATUS TENDON. Harry V. Spaulding. *American Journal of Surgery*, XLIII, 298, Feb. 1939.

In this article Dr. Spaulding gives his experiences with various lesions leading to shoulder disability, due to injury. The ruptured supraspinatus tendon is given special description.

In acromioclavicular dislocation, conservative treatment by external support is advocated. Operative results have not proved uniformly satisfactory and operation is used as a last resort. Reduction of the acute scapulohumeral dislocation is undertaken only after careful study of roentgenograms in order to be sure there is no fracture through the humeral neck. The unbooted heel in the axilla is the preferred method of reduction. In cases of chronic recurrent dislocation, the Nicola operation has proved very successful. Fracture-dislocation of the shoulder is occasionally the result of excessive torsion in

the Kocher method of reduction. Open reduction in cases in which the shaft is in the glenoid cavity, following fracture-dislocation, should be done immediately to prevent ankylosis. Synovitis and bursitis from trauma are infrequent, due to ample muscle protection. The supraspinatus tendon was ruptured in 2 per cent. of the traumatic shoulder cases. The author states that unoperated cases represent a high economic loss and place patients in the total permanent disability class. The average age of incidence suggests preexisting calcific changes. Early diagnosis and operation in complete rupture give a good prognosis.—*O. Anderson Engh, M.D., Washington, D. C.*

VOLKMANN'S CONTRACTURE. Stephen George Jones. *American Journal of Surgery*, XLIII, 325, Feb. 1939.

In most instances, Volkmann's contracture is a complication of fracture of the elbow in children. Usually it is a supracondylar fracture. If, after careful reduction of these fractures, there is diminished or absent radial pulse, loss of voluntary motor power, loss of sensation in the hand, and pain in the elbow which is increasing hourly, a fasciotomy should be done immediately. The bicipital fascia is divided and left open, and the skin is loosely sutured over it. Since supracondylar fractures showing complications may result in this deformity, a consultant to share responsibility is advised. Conservative treatment, with splints and physical therapy, is used as much as possible. When these fail, surgery may be resorted to in an effort to free tendons bound in the cicatrix. Bone resection and lowering of the origin of the flexor muscles are also used when conservative methods fail. No method of treatment is certain to effect cure.—*O. Anderson Engh, M.D., Washington, D. C.*

THE TREATMENT AND RESULTS OF 870 SEVERED TENDONS AND 57 SEVERED NERVES OF THE HAND AND FOREARM. Maurice C. O'Shea. *American Journal of Surgery*, XLIII, 346, Feb. 1939.

A large series of cases is reported by the author. Numerous classifications are given, including the causes of injuries, sites of injuries, incidence of infection in various sites, and functional results at various sites. Primary repair of tendons should be performed at once. Black silk is the suture material of choice, and the simple mattress stitch is used. Both flexor digital tendons in the hand should not be repaired at the same time. Only the flexor digitorum profundus should be repaired, so as to prevent adhesions and excess scar tissue. Partially severed nerves should be repaired to prevent formation of scar tissue, which hinders regeneration. Gentle handling of nerve structures, asepsis, and perfection of technique are essential. Infections are most frequent at the wrist. Drainage should not be used if primary repair is performed. A full-thickness skin graft should be implanted as soon as possible when there is an avulsion of skin over nerves and tendons. Early motion should be started and is safer if black silk is used. Personal postoperative management during the first two weeks in a hospital is important.

The cases of fracture and traumatic amputation complicated the treatments and end results. About three-fourths of the repaired severed nerves showed satisfactory functional results. The ulnar nerve showed the least power of regeneration, especially in motor power.—*O. Anderson Engh, M.D., Washington, D. C.*

THE SHELF OPERATION FOR CONGENITAL DISLOCATION OF THE HIP. Edward L. Compere. *American Journal of Surgery*, XLIII, 404, Feb. 1939.

When the acetabulum is found to be inadequate, the shelf operation is indicated. The author's experience with the usual shelf from the ilium, however, has not been as good as with the tibial bone-peg shelf which he describes; in this method three wedges, shaped from tibial bone, are driven above the femoral head. The dislocation of the head is reduced by skeletal traction. The accurate placement of the peg shelf, its hard con-

sistency, and the stronger anchorage are advantages. The series of end results obtained by the regular shelf procedure places it in the ineffective-method group, whereas the peg operation in more recent cases appears to be effective. Factors which may explain the failure of the shelf operation to correct the limp, to permit painless motion, and to give stability are discussed.—*O. Anderson Engh, M.D., Washington, D. C.*

Reconstruction of Top of Femur (Lever) or Its Elongation in Paralytic Conditions. Fred H. Albee. *American Journal of Surgery*, XLIII, 416, Feb. 1939.

The top of the femur (head, neck, greater trochanter) is compared to the olecranon of the elbow in its function as a lever. However, instead of functioning only in one direction, as seen in the olecranon process, the femoral lever provides a mechanical apparatus for abduction and inward and external rotation of the lower limb at the hip. Stabilization of the hip joint and active control of the weight-bearing relationship between the femur and pelvis depend on this lever. In conditions in which the lever is shortened—such as "healed tuberculosis", acute epiphysitis, maldevelopment in congenital dislocation of the hip, fracture of the femoral neck with non-union and bone absorption, shortening following arthroplasty, or involvement by infantile paralysis of the muscles inserting in this region—a reconstruction operation is used. This aims at lengthening the shortened lever and is done in the cases of non-union with absorption by inserting the femoral head as a wedge. The upper ilium and tibia are also used in some of the cases for bone-graft material. Diagrams and roentgenograms of the various conditions clearly demonstrate the principle of lengthened leverage.—*O. Anderson Engh, M.D., Washington, D. C.*

Operative Treatment of Genu Recurvatum. A. Leo Brett. *American Journal of Surgery*, XLIII, 466, Feb. 1939.

Mild genu recurvatum causes little disability, but when it is severe it produces a crippling deformity, necessitating the wearing of a support. The underlying pathology is recognized generally as being due to weakness of the musculature or ligaments of the knee. The writer, however, calls attention to the downward slope of the anterior surface of the tibia and uses an operation designed to correct it. Bone chips are introduced into a wedge-shaped gap, facing anteriorly in the upper tibia. Six cases have been successfully treated by this method. Diagrams and roentgenograms show the procedure and the results of treatment.—*O. Anderson Engh, M.D., Washington, D. C.*

Reconstruction of the Ligaments of the Knee. Willis C. Campbell. *American Journal of Surgery*, XLIII, 473, Feb. 1939.

There is often a rupture of one or more ligaments of the knee with cartilage injury. The tibial collateral and anterior cruciate ligaments are most frequently involved. The persistence of symptoms after excision of cartilage is often due to ligamentous injury. The sensation of "giving way" must always suggest ligament rupture. Operation for repair of the ligaments is indicated only in patients with continued disability and increasing instability. Thirty-nine cases of injury are discussed, twenty-three of which have been followed. Nineteen good results were obtained. The author presents his own and other operations for repair of ligamentous ruptures, and states that operations are very definitely indicated in young, active individuals with prolonged disability. He stresses good anatomical restoration of the ligaments involved.—*O. Anderson Engh, M.D., Washington, D. C.*

Rupture of the Lateral Ligaments of the Knee Joint. José Valls. *American Journal of Surgery*, XLIII, 486, Feb. 1939.

Any injury which causes a lesion of the collateral ligaments also invariably affects at the same time, in a greater or lesser degree, the capsule and the cruciate ligaments.

The physiology and pathology of the condition are given by the author. He feels that incomplete rupture is rare. The upper end of the tibial collateral ligament is most often affected. Lateral motion is the chief test. Rotation movement is a little greater than in the sound knee. The treatment used in slight lesions consists in immobilization in extension for from two to eight weeks; active and passive movements of the joints; muscle massage; exercise in apparatus; and walking with continuation of physiotherapy for from one to two weeks or until recovery has taken place. Patients with lesions of medium severity are treated by immobilization for from ten to twelve weeks and physiotherapy or early surgery. Serious lesions are treated early by surgery. The author's own method is described.—*O. Anderson Engh, M.D., Washington, D. C.*

Recurrent Dislocation of the Patella. Frank R. Ober. *American Journal of Surgery*, XLIII, 497, Feb. 1939.

Recurrent slipping or dislocation of the patella may be congenital, acquired, or a combination of both. In most instances, it is a lateral dislocation. A degenerative type of arthritis frequently follows chronic slipping of the patella. In the milder cases, conservative treatment is used. Recurrent dislocation may occur under the following conditions: (1) knock-knee; (2) outward tibial rotation; (3) high patella; (4) low outer condyle; (5) congenital malattachment of the iliotibial band and its intermuscular septum; (6) trauma; and (7) improper closure of median parapatellar incisions. Early operations prevent adhesions and avoid arthritic changes. The various operative methods are described.—*O. Anderson Engh, M.D., Washington, D. C.*

Cysts of the Semilunar Cartilage. George E. Bennett. *American Journal of Surgery*, XLIII, 512, Feb. 1939.

Cysts of the semilunar cartilage are comparatively rare. Authors agree on symptomatology, signs, and treatment, but disagree on etiology. A limp or limitation of motion is seldom present, but easy fatigue of the involved leg is frequent. Cysts, themselves, are not responsible for relaxation of the ligaments of the knee. On examination, it is not common to find an increase in synovial fluid, atrophy of the thigh and calf, or flexion deformities. Diagnosis is not difficult as a rule. Differentiation from a bursa arising from the medial and lateral ligaments and true synovial outpouchings is the most common problem.

The author gives various theories concerning the etiology, including trauma, local changes in cell metabolism, and congenital causes. Treatment consists in complete removal of the cartilage with the cyst. Simple removal of the cyst is often followed by recurrence. The cysts are usually found to be multilocular. No signs of active inflammation are reported in the cysts. Dr. Bennett believes that the cyst arises in a traumatized area in the capsular border of the cartilage, which undergoes mucoid degeneration and cyst formation.—*O. Anderson Engh, M.D., Washington, D. C.*

Lesions of the Tibial Tubercle and Their Treatment. David M. Bosworth. *American Journal of Surgery*, XLIII, 526, Feb. 1939.

Conservative measures do not always relieve epiphysitis of the tibial tubercle. Cases have persisted as long as five years with this treatment. The author has been pegging the tubercle area with autogenous tibial grafts during the past six years. Prompt and permanent relief of acute symptoms has resulted. A slightly enlarged tubercle, painful when kneeling on hard surfaces, however, remains in some cases. Roentgenograms of cases are given, including the results after treatment. Drawings of the operative procedure are shown. Fourteen patients operated on for over a year have been relieved of acute symptoms.—*O. Anderson Engh, M.D., Washington, D. C.*

SUBASTRAGALAR ARTHRODESIS. W. Russell MacAusland. *American Journal of Surgery*, XLIII, 535, Feb. 1939.

This procedure is generally accepted today for the correction of deformity and the stabilization of certain feet whose function is disordered through paralysis, disease, or trauma. Arthrodesis of the subastragalar and midtarsal joints does not interfere with the useful function of the foot. In tuberculous or arthritic feet, the arthrodesis consists in stiffening the joint and displacing the foot slightly backward. In paralytics, the foot is displaced well backward to create a rocker foot. The paralytic foot is thus given better balance and better control. The operation is described by the author, and sections of the bone removed and the displacement of the foot backward are shown. Good results have been obtained in sixteen cases. It is used on cavus, valgus, or varus deformities associated with calcaneus and weak feet generally. The procedure should not be done until at least two years have elapsed following the acute attack.—*O. Anderson Engh, M.D., Washington, D. C.*

HYPERPARATHYROIDISM AND OSTEITIS FIBROSA CYSTICA. Custis Lee Hall. *American Journal of Surgery*, XLIII, 585, Feb. 1939.

The first clear insight into the relation between cystic bone disease and the parathyroids was obtained in 1891 by von Recklinghausen. The work of others—including Davis-Colley, Vassale and Generali, Askanazy, Erdheim, Lundborg, Hoffheinz, Berman and Collip, Greenwald and Aub, Barr, Jaffe and Blair—is mentioned. The disease is slow in onset. Pain, exaggerated by activity, is present in the skeletal system, even before deformities and fractures are seen. Spontaneous fractures and cysts occur later, intimating serious disorder. General weakness, loss of appetite and weight, cardiac irregularities, and anaemia develop. Urinary symptoms—such as colic, stone formation, and dysuria—are common. Laboratory findings are hypercalcaemia, hypercalciuria, and increased serum or plasma phosphatase. Inorganic phosphorus is usually decreased.

Two types are discussed. The first is the localized form, where a localized bone cyst is discovered and in which there is no association with parathyroid tumor or with calcium or phosphorus metabolism. The second type is the generalized form. Diagnosis in advanced cases is not difficult, but early cases, with a localized bone lesion, cause confusion. The condition must be differentiated from osteomalacia, multiple myeloma, metastatic carcinoma, pituitary basophilism, and osteogenesis imperfecta.

Treatment is of three types: (1) medical, (2) surgical, (3) x-ray. The impressive results obtained by Merritt and his workers with x-ray therapy in a series of sixty-nine cases indicate that this is an ideal procedure. Much less technical difficulty is encountered and better results are obtained.—*O. Anderson Engh, M.D., Washington, D. C.*

A BIOCHEMICAL INVESTIGATION OF ARTHRITIS. PRELIMINARY REPORT ON URIC ACID, GLUTATHIONE, AND SULFUR IN THE BLOOD; AND SULFUR IN THE URINE. Thomas F. Wheeldon and Lewis H. Bosher. *American Journal of Surgery*, XLIII, 598, Feb. 1939.

This article is a preliminary report on uric acid, glutathione, and sulphur in the blood and sulphur in the urine. The authors hope to establish some biochemical evidence of the relationship between sulphur metabolism and arthritis. They use a new sulphur preparation in the investigation, feeling that the more accurate standardization of this preparation and the higher degree of colloidal dispersion, together with the clinical effects noted, make it preferable to those previously used. The possible tie-up between adrenal cortex, sulphur metabolism, and arthritis is recognized. The following conclusions were reached as a result of their studies in a large series of cases:

1. No abnormal variation in the average reduced blood glutathione value of seventy-four arthritic patients could be ascertained.

2. A slightly higher average reduced blood glutathione value was found in females than in males.

3. No essential age variations in the glutathione values were revealed.

4. A series of thirty-four arthritic patients showed an average reduction in the urine sulphate sulphur excretion.

5. These same patients showed average neutral sulphur and ethereal sulphate sulphur values, which were essentially normal.

6. Seventy-two arthritics showed normal blood uric-acid values.

7. The average of blood inorganic sulphate values of twenty-five arthritic patients, determined by the method of Letonoff and Reinhold, appeared to be normal.

8. Normal values for total sulphur and total sulphates of the blood, determined by a new method, are presented.—*O. Arno Loop, M.D., Washington, D. C.*

THE EFFECT OF URINARY BLADDER EPITHELIUM AND EXTRACTS ON THE FORMATION OF BONE. A FURTHER EXPERIMENTAL STUDY. Glover H. Copher. *Annals of Surgery*, CVIII, 931, 1938.

In previous experiments the author showed that autogenous transplants of bladder epithelium used to bridge gaps in the radius of dogs produced the formation of new bone, with resulting union. The present paper reports the results of experiments in which non-union was produced and then from fourteen to sixteen weeks later the gap in the bone was filled with autogenous transplants of bladder epithelium. A group of six dogs were used for this experiment. The dogs were sacrificed fifteen weeks after the transplantation operation.

The same procedure, except that the periosteum was also removed from the defect, was carried out on another group of six dogs. The non-union was allowed to exist for nine months before the transplantation of the bladder epithelium, and the dogs were allowed to live twenty-seven months following this procedure. The results of these experiments were determined by gross, roentgenographic, and microscopic examinations. Blood calcium and phosphorus determinations were also made, but they showed no significant change.

The result showed that epithelium from the bladder of a dog when transplanted, has the ability to induce ossification in certain connective tissues. Firm union of the ends of the defects was usually produced when the periosteum was not removed. When the periosteum was completely removed in long defects of bone, it was possible to bridge the gap with true membranous bone, but firm union of the ends of the bones did not occur.

Extracts were made from the epithelium of pig's bladder and injected intravenously into dogs. These injections failed to produce any change in the blood calcium or phosphorus. No effect was produced when these extracts were injected locally at the site of bone defects.—*O. B. Bolibaugh, M.D., San Francisco, California.*

ACUTE HEMATOGENOUS BURSITIS. Morris B. Cooperman. *Annals of Surgery*, CVIII, 1094, 1938.

Acute bursal infections of hematogenous origin are rare complications of acute infectious diseases or septicaemias, or are metastatic lesions secondary to infections in other parts of the body. They must be differentiated from acute infectious arthritis or acute osteomyelitis. Needling is an important diagnostic measure. One must have thorough knowledge of the anatomical location of the various bursae. Gluteal bursitis is most difficult to diagnose. The treatment is incision and drainage when fluctuation is present.

The author reports six cases, four involving the subacromial bursa and two involving the prepatellar and gluteal bursae.—*O. B. Bolibaugh, M.D., San Francisco, California.*

CHROMICIZED BEEF TENDON FOR INTERNAL FIXATION OF FRACTURES. Frank P. Strickler. *Annals of Surgery*, CVIII, 1102, 1938.

The author describes the use of chromicized beef tendon prepared in plates, cuffs, and pegs for internal fixation in fractures. It is claimed to have the following advantages: it can be made absolutely sterile; it is easy to work with; it does not show on a

roentgenogram; it will remain in position sixty to ninety days; if properly introduced, it has sufficient strength to maintain reduction of the fracture; and it is absorbed in about ninety days. Ten cases in which this material was used are reported.—*O. B. Bolibaugh, M.D., San Francisco, California.*

PULSATING, BENIGN GIANT CELL TUMORS OF BONE. G. Burroughs Mider and John J. Morton. *Annals of Surgery*, CIX, 126, Jan. 1939.

Pulsating benign giant-cell tumors of bone are very rare. In his classical description of giant-cell tumors, Nélaton, in 1860, reported one case of such a tumor in the upper end of the tibia, which pulsated. The leg was amputated and the patient was alive eight years later.

Since 1900 only four cases of pulsating giant-cell tumors of bone which can be definitely identified as benign are to be found in American literature. The author gives case reports of these four cases and adds one of his own, which he describes in considerable detail.

This patient was a Jewish female, fifty-two years of age. When first seen, the tumor measured nine by twelve centimeters and was overlying the left ilium and the left sacro-iliac joint. Pulsation of the mass was marked and synchronous with the heart beat. Histologically the neoplasm was a typical benign giant-cell tumor.

The tumor was removed in a series of six operations from November 1936 to May 1937. Several months later this patient died with a rapidly progressing intra-cranial lesion associated with signs of infection. No autopsy was secured. However, there were no signs of metastases or recurrence.

The differential diagnosis of these tumors is difficult. They may be confused with malignant bone tumors, hemangiomata of bone, or carcinomatous metastases to bone.

The treatment presents special problems. Surgery must first aim at hemostasis. In the lower extremity amputation is frequently necessary. Excision, when possible, is the treatment of choice.—*O. B. Bolibaugh, M.D., San Francisco, California.*

THE TREATMENT OF DELAYED UNION AND NONUNION OF FRACTURES BY SUBCUTANEOUS DRILLING. R. Arnold Griswold. *Annals of Surgery*, CIX, 135, Jan. 1939.

The author distinguishes between delayed union and non-union, but considers both conditions due to local rather than to constitutional factors. A common cause is lack of approximation of fragments, due to interposed soft tissues. He also mentions impaired local blood supply, due to extensive soft-tissue damage.

When non-union exists, conditions comparable to a fresh fracture must be restored before union will take place. This can be accomplished by subcutaneous drilling. This procedure was first recommended forty years ago. It was revised by Beck in 1929 and popularized by Böhler.

The author describes the technique, which consists essentially of multiple drillings through the sclerosed bone ends, scar, and medullary canal with a two-millimeter Stille-Kirschner wire. Thus new vascular channels are produced. About forty drill holes are made from four points, the drill holes radiating fanwise. In oblique fractures of the tibia an oblique osteotomy of the fibula is desirable. Walking casts are applied, and the patients are allowed up in forty-eight hours.

Twelve cases are reported. The author concludes from his experience that subcutaneous drilling is a safe, simple, and effective treatment for delayed union and non-union and recommends this method in early cases before more radical procedures are considered.—*O. B. Bolibaugh, M.D., San Francisco, California.*

A CASE OF SARCOMA OF THE UPPER END OF HUMERUS, TREATED BY EXCISION AND BONE-GRAFT FROM FIBULA. P. P. Sheth, R. D. Munshi, and S. M. Dave. *The Antiseptic*, XXXV, 1127, 1938.

The authors report a case of sarcoma of the upper end of the humerus, which was treated by excision and replacement with a six-inch graft from the upper end of the

fibula. Both wounds healed *per primam*, and six months later there was perfect function of the leg, with all movements of the shoulder present though limited. The specimen proved to be a small round-celled and spindle-celled osteosarcoma, but without metastases to the lungs or axillary lymph nodes.—*Robert M. Green, M.D., Boston, Massachusetts.*

Spätergebnisse von Sehnennähten an Arm und Hand (Late Results of Tendon Suture in the Arm and Hand). Fritz Heck. *Archiv fur Orthopadische und Unfall-Chirurgie*, XXXIX, 21, 1938.

On the basis of seventy-five cases of tendon suture in the arm and hand (fifty-nine primary and sixteen delayed) and a review of the literature, the writer recommends primary suture where at all possible, except in cases of badly mangled flexor tendons. In the case of the extensor tendons, there was little difference between the results obtained by immediate suture and those following delayed suture. In the flexor tendons, the results were poorer with the delayed suture.—*W. P. Blount, M.D., Milwaukee, Wisconsin.*

Die Brüche des körpernahen Oberarmendes (Fractures of the Proximal End of the Humerus). Franz Scheidter. *Archiv fur Orthopadische und Unfall-Chirurgie*, XXXIX, 29, 1938.

One hundred and twenty-five cases of fracture of the proximal end of the humerus are analyzed and tabulated, and the etiology and treatment are discussed at considerable length. These fractures are more frequent in older individuals, and two-thirds of them are extracapsular. They show typical displacements.

Reduction is preferably accomplished under local anaesthesia with the patient in the sitting position. The subject's arms are clasped behind the back of the operator, who grasps them just below the shoulders. The patient is held by an assistant, and the fracture is reduced by rotation of the operator's body. Fixation by an abduction plaster is preferred. In simple cases a splint is used. Open reduction is rarely indicated, and then only with nerve injuries or fracture dislocations which cannot be reduced by closed methods. Residual disability is rare and is usually caused by capsular changes rather than by malposition.—*W. P. Blount, M.D., Milwaukee, Wisconsin.*

Zur Histologie des Kniegelenksmeniscus im ersten und zweiten Lebensjahrzehnt (The Histology of the Meniscus of the Knee in the First and Second Decades). Raimund Wittmoser. *Archiv fur Orthopadische und Unfall-Chirurgie*, XXXIX, 96, 1938.

Gross and microscopic studies of the knees of fifty cadavera, ranging from the newborn to thirty years of age, form the basis of an extensive report on the development, vascular supply, histology, and pathological anatomy of the meniscus.

The connective-tissue meniscus of the newborn is partially replaced after the third month with a cartilage-like substance. There is a special outer layer, with a central zone of fibrous and avascular chondroid tissue. Especially about the second year there is hydropic vascular degeneration in the region about the chondroid zone, which is directly related to the development of the latter. The physiological processes must be distinguished from the pathological.—*Walter P. Blount, M.D., Milwaukee, Wisconsin.*

Evolution of Treatment of Fracture of Neck of Femur. Peter Coridasco. *Archives of Surgery*, XXXVII, 871, 1938

The reawakening of interest in the treatment of fractures of the neck of the femur makes this article a very timely one.

The author surveys the clinical aspects, describing the usual site of the fracture, the etiology, and clinical signs. The anatomy of the hip joint, with a study of the circulation and muscle control, is presented in concise form. The history of the treatment is then considered. Apparently Ambroise Paré was the first man to report a fracture of the neck of the femur. He used compresses and splints held in position by a spica bandage. From his time to the present there have been tried and discarded many forms of traction, distention, and splinting. The Whitman technique for reduction and immobilization in plaster, the open reduction for the insertion of bone pegs and nails, and, finally, the technique of "blind" fixation are described as milestones in the evolution of the treatment. A useful bibliography is appended to the article.—*I. William Nachlas, M.D., Baltimore, Maryland.*

Growth in Length of the Vertebrae. S. L. Haas. *Archives of Surgery*, XXXVIII, 245, Feb. 1939.

The author calls attention to the fact that there has been some uncertainty as to the method of growth of the vertebrae. In an effort to obtain accurate information in regard to this, metal markers were introduced into the vertebrae of experimental animals, some in the middle portion and some in the epiphyses. The animals were allowed to live and grow. Examinations made after several months had elapsed showed that growth in length takes place by proliferation at the epiphyseal cartilage plate and not within the middle portion of the body of the vertebra.—*I. William Nachlas, M.D., Baltimore, Maryland.*

Posterior Dislocation of Lower Femoral Epiphysis in Breech Delivery. Michael S. Burman and Maurice J. Langsam. *Archives of Surgery*, XXXVIII, 250, Feb. 1939.

The literature on fractures of the lower femoral epiphysis as a result of difficult breech delivery is surveyed and one new case is reported. It is indicated that the dislocation of the lower epiphysis is posterior, the reverse of the usual cartwheel type of displacement. There is a resultant flexion deformity of the knee joint, at times associated with valgus. The condition is recognized by the swelling about the knee, and by the facts that the limb is limp and passive motions produce pain. Severe periosteal stripping, with ossification of the hemorrhage, occurs. Indeed, the size of the ossified mass may overshadow the dislocation. Repair takes place by the absorption of the bony mass so that the lower end of the femur is ultimately bent to meet the displaced epiphysis. This correction seems to occur spontaneously, so that treatment may be restricted to simple immobilization of the knee with the limb in extension. The prognosis for ultimate recovery and function is good.—*I. William Nachlas, M.D., Baltimore, Maryland.*

Onlay Bone Graft for Ununited Fractures. Willis C. Campbell. *Archives of Surgery*, XXXVIII, 313, Feb. 1939.

Campbell advocates the use of a massive onlay transplant for ununited fractures. In this paper, which is a supplementary report covering a total of 261 bones of 213 patients, there is presented an analysis of the results obtained not only in the group as a whole but also in the various bones involved. The technique employed requires a plain flat surface for the reception of the graft, the use of cancellous bone which is packed around the site of the fracture, the elimination of the endosteum from the graft, and the fixation of the graft by means of autogenous bone pegs. This procedure has given solid union in 93.6 per cent. of the cases. Even of the thirty-one patients with postoperative infections, 77.4 per cent. showed good bony union.—*I. William Nachlas, M.D., Baltimore, Maryland.*

Über Ergebnisse nach Meniskusoperationen (Results of Operations on the Meniscus). Siegfried Dengler. *Bruns' Beitrage zu klinschen Chirurgie*, CLXVII, 449, 1938.

Serious damage to the meniscus is often associated with lesions of the collateral ligaments. Immediate operation, in which other lesions are overlooked, often gives unsatisfactory results. Therefore, where an exact differential diagnosis can be made, the best time for operation is after the disappearance of the acute symptoms. Minor injuries, such as fissures and loosened menisci without locking, can be treated conservatively. Because the "S" incision weakens the capsule, ligaments, and muscles, the parapatellar incision is preferable. Strangely enough, the author recommends only partial removal of the damaged section and equalization of the margins stating that the residue of the posterior part of the meniscus does no harm provided that it has not itself been the cause of the avulsion. Sometimes changes, such as meniscal cysts and Hoffa's disease, are present. The author concludes that too many knees are operated upon for meniscus lesions, and he, therefore, urges the restricted use of operations.—*Ernst H. Bettmann, M.D., White Plains, New York.*

Ein Beitrag zur Frage der traumatisch entstandenen Weichteiltumoren des Fusses (Comment on the Question of the Traumatic Origin of Soft-Tissue Tumors of the Foot). Werner Dreyer. *Bruns Beitrage zur klinischen Chirurgie*, CLXVIII, 92, 1938.

Examination of a male, thirty-four years old, who had cut his foot with a marble at the age of ten, revealed a tumor larger than a man's fist on the sole of the foot. Because of the diagnosis of sarcoma, amputation was recommended. Tuberculosis and inflammation were excluded. After one year, the tumor showed fluctuation. Roentgenographic examination revealed no bone affection, but kidney-shaped shadows with calcified spots in the soft tissue were visible. Extirpation of the tumor disclosed a multicellular fibroma with regressive metamorphosis.

The following conclusions are drawn: Attacks of pain with resulting swelling, hyperpigmentation, and atrophy of the bone are typical of sarcoma. On the contrary, benign tumors are characterized by (1) slow but intermittently increasing growth; (2) nodules, usually having their origin from the fascia, with no signs of ulceration or infiltration; (3) no metastasis; (4) no pain; and (5) no sponge-like consistency.—*Ernst H. Bettmann, M.D., White Plains, New York.*

Zur Frage des Halsrippensyndroms (Comment on the Syndrome of the Cervical Rib). D. v. Klimkó. *Bruns' Beitrage zur klinischen Chirurgie*, CLXVIII, 129, 1938.

The author reports the case of a patient, thirty-eight years of age, who, for two years, had noticed a prickling sensation in the right arm, which later changed to acute pain along the ulnar aspect of the forearm, finally radiating throughout the entire arm. Grasping, raising, and pressing with the hand were impossible, and the whole arm was weak and extremely painful. Roentgenographic examination revealed bifurcation of the transverse process of the body of the seventh cervical vertebra. Palpation of the supraclavicular region disclosed a painful bone formation. There was atrophy of the abductor pollicis brevis, flexor pollicis brevis, opponens pollicis, adductor pollicis, and interossei.

The operation consisted in the sectioning of the superficial fascia, together with the clavicular portion of the sternocleidomastoid; ligation of the jugular vein; incision of the inferior belly of the omohyoid and scalenus anterior; and resection of the cervical rib. Complete recovery followed.—*Ernst H. Bettmann, M.D., White Plains, New York.*

Der Salben-Gipsverband in der Wundbehandlung (Plaster-of-Paris and Cod-Liver-Oil Bandages in the Treatment of Wounds. H. G. Burgass. *Bruns' Beiträge zur klinischen Chirurgie*, CLXVIII, 384, 1938.

The author reports on the treatment of wounds with cod-liver-oil ointment and plas-

ter-of-Paris bandages. In none of the 500 patients so treated did secondary infection or contraction of the scars develop. The treatment is interrupted by exposure to the air for from twenty-four to forty-eight hours every week. Striking is the rapid formation of granulations, covered by a layer of pus, which seems to be favorable to healing.—*Ernst H. Bettmann, M.D., White Plains, New York.*

DIE TUBERKULOSE DES TROCHANTER MAJOR UND DER SCHLEIMBEUTEL DER REGIO TROCHANTERICA (Tuberculosis of the Greater Trochanter and the Bursa Mucosa of the Trochanteric Region). W. v. Sassen. *Bruns' Beiträge zur klinischen Chirurgie,* CLXVIII, 594, 1938.

This condition is rather rare. Sven Johansson observed it in 2.3 per cent. of 4000 children and Beryk Sanen noted it in 1.07 per cent. of his cases. Von Sassen observed six cases in ten years. The following case is typical. A male worker, twenty-one years old, complained of drawing pain in the right hip and pressure pain over the greater trochanter. No limitation of motion was present, and there was no atrophy. Roentgenographic examination revealed a sequestrum, the size of a hazelnut, in the lower part of the greater trochanter, with destruction of cortex, and a second sequestrum, the size of a cherry stone, more laterally and proximally. At operation these two sequestra were removed, and primary healing occurred. Histological examination showed giant cells, necrosis, epitheloid cells, and lymphocytes.

In other cases, abscesses, which communicated with a bursa, were found.

Clinically, there is very slow development, extending from one to several years. The signs are: local pain, fatigue, and a fluctuating mass around the greater trochanter, while the general condition is unchanged.

In making a differential diagnosis one should consider coxitis, tumor, osteitis fibrosa, osteomyelitis, and cysts. Bursitis and osteitis are often associated. If the bone structure is unchanged and if a fluctuating tumor is palpable, there is more probability of tuberculosis of a bursa. There are two forms: (1) cystic-fibrocystic bursitis; and (2) bursitis with irregular cortex, due to the extension of the process from the infected bursa.

There is little tendency for spreading to the hip joint; this occurred in only two cases. In some cases a cure was effected without operation, but operation with excision into normal tissue is to be preferred.—*Ernst H. Bettmann, M.D., White Plains, New York.*

THE TREATMENT OF OLD POSTERIOR DISLOCATION OF THE ELBOW. C. M. Meng. *The Chinese Medical Journal,* LIII, 539, 1938.

In an excellent article, the author discusses the pathological anatomy, the technique of open reduction, the postoperative care, and the end results in twenty cases of old unreduced dislocations of the elbow. The duration of these dislocations ranged between four weeks and three years, the majority having existed longer than three months. The age incidence ranged between twelve and forty-four years, and all of the patients were males.

In discussing the pathological anatomy, special importance is attached to: (1) the shortened triceps tendon; (2) the contracture of the periarticular ligaments; and (3) the formation of callus behind the lower end of the humerus. Mention is also made of the occasional formation of new bone in the region of the anterior capsule. The roentgenographic appearance of these old dislocations is sometimes deceiving, so that, in Dr. Meng's opinion, one is not able to tell before opening up the joint just what the condition of the articular surfaces and their adjacent structures may actually be.

The treatment of these cases is most successful by means of open reduction, and the author describes his operative technique as being a posterior skin incision similar to that used by Speed. This incision exposes the entire posterior surface of the triceps tendon, and, after the ulnar nerve has been carefully isolated and gently retracted, the triceps tendon is divided by a transverse incision about one and five-tenths centimeters proximal

to the tip of the olecranon process. This division of the triceps tendon provides a direct approach to the posterior aspect of the dislocated joint and allows a careful removal of all of the scar tissue and callus that may be occupying the space behind the lower end of the humerus. The author also makes a point of releasing any adhesions that may be present and especially the scar tissue which is frequently found above the head of the radius. After all of the articular surfaces have been cleared and adhesions freed, reduction of the dislocation is then accomplished without much difficulty. Following reduction, the anterior aspect of the elbow joint can be more readily examined, and, when callus is found to be present in front of the joint, it should be removed with as little trauma as possible.

The next step in the technique of operation is the repair of the triceps tendon, which the author accomplishes by means of double mattress sutures of fascia lata. Following repair of the triceps tendon, the elbow joint is then held in the right-angle position during the closure of the wound. Single or double plaster slabs are applied over sterile dressings, the elbow being kept in the position of right-angle flexion. The author has tried various methods of tenotomizing the triceps tendon and reaches the conclusion that transverse tenotomy is preferable to the "V" or "Z" cut of the tendon, because sufficient tendinous tissue is then left on the cut ends of the tendon to make adequate suture under proper muscle tension, and, if necessary, to allow lengthening of the tendon to any desired extent without weakening the power of the muscle.

The postoperative care consists in early motion of fingers and wrist, removal of skin sutures on the tenth or twelfth day, and, following this, daily gentle active and passive movements of the elbow. Following removal of the plaster splints, the elbow is held in a position of acute flexion by means of a collar and cuff sling, which is gradually loosened during the day until, by evening, the elbow may reach the maximum possible extension. Through the night, however, the elbow is kept in acute flexion by means of the sling and cuff. The author warns against forceful manipulation of these elbow joints, especially after the three-week period, when motion sometimes has a tendency to be further limited. Instead of using force at such times, he advocates a short period of rest, later followed by exercises.

Open reduction as described was performed in fourteen cases: excellent results were obtained in five; good results, in eight; and a fair result, in one. Arthroplasties were necessary in four cases: an excellent result was obtained in one instance; a poor result, in another; and, in the remaining two cases, the observation period was too short for an end-result rating. Resection of the lower end of the humerus had to be performed in two cases, the result being good in one and fair in the other.

The article represents a wide and practical experience and is a noteworthy contribution to the subject with which it deals.—*George W. Van Gorder, M.D., Boston, Massachusetts.*

ATROFIA CONGÉNITA CUBITAL DISTAL (Congenital Atrophy of the Distal End of the Ulna). Manuel A. Manzanilla. *Cirugía y Cirujanos*, VI, 509, 1938.

The author discusses the anomalies in the development of the ulna and the anatomical and functional consequences upon the elbow and the wrist. He lays stress on the fact that, while the total absence of bone is not a rarity, congenital atrophy is. Blandin, in 1837, described a case in which the ulna did not reach the elbow joint, and this is the only case which the author was able to find in the literature. He then reports a case of congenital atrophy of the distal end of the ulna, and advocates its correction by the technique which he has worked out: (1) creation of a groove on the dorsal aspect of the ulna, embracing its inferior third and continued on the dorsal aspect of the triangular; and (2) the insertion of a bone graft from the tibia (after the manner of Albee) in the ulna-triangular groove. The author believes that osteotomy of the radius is not necessary, and states that as an auxiliary measure some type of calcium therapy (adrenalin, parathyroid extract, vitamin D, or ultra-violet light) may be advisable.

PLASTIA TENDINOSA PARA REPARAR LA PÉRDIDA DE LA OPOSICIÓN DEL PULGAR CONSECUTIVA A LA PARÁLISIS INFANTIL (TÉCNICA DE BUNNELL). [Tenoplasty for Repairing Loss of Opposition of the Thumb Following Infantile Paralysis (Bunnell's Technique).] Alberto Inclán y Raul Rodriguez. *Cirugía Ortopédica y Traumatología*, VI, 140, 1938.

The authors point out that loss of ability to oppose the thumb is due to paralysis of the muscles of the thenar eminence, and the three most common causes of this are poliomyelitis, arthritis, and section of a branch of the median nerve which supplies the muscles of the thenar eminence. Bunnell has analyzed the mechanism involved in opposition of the thumb as a complex movement in which the thumb is placed opposite and in a plane anterior to the other fingers and at the same time it rotates, so that the palmar surfaces of the fingers and thumb are facing each other. All of the joints in the thumb, including the small joints at the proximal end, are involved. The movements are produced by the muscles of the thena reminence, as follows. Angulation and pronation of the metacarpal are produced by the opponens pollicis, the adductor longus, and the flexor pollicis brevis. The external head of the flexor pollicis brevis angulates and pronates the proximal phalanx. The extensor pollicis longus and the extensor pollicis brevis help to stabilize the thumb and thus aid in the movement of opposition. Bunnell has stressed the importance of understanding the exact mechanism involved and has introduced his tenoplasty, the usefulness of which is due to reproducing anatomically the movement of opposition.

The authors report the case of an eight-year-old child who had had poliomyelitis four years previously. There was severe atrophy of the muscles of the thenar eminence, and the thumb was held in adduction with no ability to oppose the thumb. Under a brachial-plexus block, supplemented with ether anaesthesia, Bunnell's operation was done. The palmaris longus tendon was united to the attachment of the extensor pollicis brevis after the palmaris longus tendon had been run around and under the flexor carpi ulnaris tendon near its attachment to the pisiform. Emphasis is placed on two points in the procedure, which are important in securing a successful result, — namely, the tendon must point toward the pisiform, and it must insert on the dorsum of the base of the first phalanx of the thumb. Following the operation, the arm was immobilized in opposition with strips of adhesive tape for five weeks and then motion was begun. After the immobilization period, muscle reeducation was carefully carried out. At the end of a five-month period an excellent result was obtained. The thumb could be easily rolled into the palm of the hand and opposed.—*Louis W. Breck, M.D., El Paso, Texas.*

GEFÄSSRUPTUR BEI SCHULTERLUXATION (Rupture of the Vascular Structures in Shoulder Dislocations). Fritz Haas. *Deutsche Zeitschrift für Chirurgie*, CCL, 80, 1938.

The author states that rupture of the larger blood vessels occurs so infrequently in shoulder dislocations that the textbooks do not mention it. However, the consequences of vascular damage as a complication of such dislocations are so serious (the loss of an extremity or even death may result) that definite steps should be taken to prevent it. He feels that injury to vascular structures is more probable during the mechanism of reduction than during the injury. The main clinical symptom is a sudden formation of a large hematoma in the axilla with a rapid radial pulse.—*T. J. Greteman, M.D., Iowa City, Iowa.*

PSEUDOHYPERTROPHIC MUSCULAR DYSTROPHY. AN EVALUATION OF RECENT STUDIES. Louis Scheman, Philip Lewin, and Samuel Soskin. *The Journal of the American Medical Association*, CXI, 2265, 1938.

The authors base this paper on a study of five cases of pseudohypertrophic muscular dystrophy to determine whether or not a deficiency in the external secretion of the pancreas plays a rôle in part of this syndrome. The patients were classified as follows:

Duchenne type, two patients; Duchenne type with Froelich's syndrome, two patients; Duchenne type with Landouzy-Dejerine syndrome, one patient. All of these patients had passed through the gamut of more recent types of therapy without benefit.

In an analysis of their data, which is presented in tabular form, they could find no evidence that the pancreas was involved. Detailed studies were made on stool examinations, blood-sugar determinations, duodenal-content analysis, and urinalysis. Any improvement noted was not due to specific therapy. Clinically the effect of therapy was judged by a series of test exercises. All of the patients showed some improvement, but it was not related to the various types of therapy, which included glucose and insulin, insulin alone, high and low protein diets, and the administration of pancreatin.

The authors conclude, however, that muscle pigment or myoglobin is of importance in the economy of muscular processes and that when this is studied further an important clue in the treatment of the myadystrophic patient will be found.—*Henry H. Beckering, M.D., Dallas, Texas.*

EIGHTY-SIX CASES OF CHRONIC SYNOVITIS OF KNEE JOINT TREATED BY SYNOVECTOMY. George A. L. Inge. *The Journal of the American Medical Association*, CXI, 2451, 1938.

In this paper, the author analyzes the late results in eighty-six cases treated by synovectomy of the knee joint. The average follow-up period was five and six-tenths years.

Due to mistaken diagnosis, six of the patients operated upon had tuberculosis of the knee joint. In all of these there was rapid recurrence and fusion was required. In three other cases of specific lesion there were recurrences. No patient who gave a positive Wassermann reaction was operated upon.

The surgical technique consisted of two vertical parapatellar incisions. The synovial membrane was removed from only the anterior compartment and suprapatellar pouch in practically all cases. The infrapatellar fat pad was removed routinely. In six cases the semilunar cartilages were not disturbed. Good results were obtained in all of them. There were no deaths and no wound infections.

The pathology was fundamentally the same in the tissues examined from these cases. There were hypertrophy and hyperplasia of the synovial layer of cells and a thickening of the subsynovial layers by oedema, fibrosis, engorgement of blood vessels, and scattered foci of round-cell infiltration. There was no correlation between the histological picture and the clinical end results.

The percentage of satisfactory end results varied with the different groups of patients. Synovectomy was performed upon twenty-six rheumatoid-arthritic knees with the result that 61 per cent. were improved symptomatically and only 34 per cent. were improved functionally. Symptomatic relief was obtained in 90 per cent. of twenty painful, disorganized, osteo-arthritic knees. The results in some of these elderly cases were dramatic. In twenty-two properly selected cases with simple chronic proliferative arthritis the results were exceptionally good,—95.4 per cent. with symptomatic improvement and 72.7 per cent. with functional improvement.—*H. M. Childress, M.D., Dallas, Texas.*

ESTIMATION OF DISABILITY AFTER INJURIES TO BONES AND JOINTS. Walter G. Stern. *The Journal of the American Medical Association*, CXII, 293, Jan. 28, 1939.

Disability has been defined as "the inability to work with the same degree of ease and comfort as before the injury was sustained". The determination of disability has become an important factor in medicine since the advent of social security regulations and the marked increase in traumatic injuries.

The federal and all state governments (except those of Arkansas and Mississippi) by law must pay compensation to injured employees. Practically all of them have

adopted fixed schedules of percentage of loss for definite disab
may vary greatly in different states. The studies and co
Association of Industrial Boards and Commissions h
and have thereby produced more uniform procedu

The rating of permanent disability should be m
Some of these are: (1) age, (2) type of occupation,
work (morale) and other psychic factors, (5) preexisti
sequence of injury, (6) multiple injuries.

The author believes that the examiner should judg
the case. The records of court decisions are valueless a
uniform method of rating disabilities is badly needed.—*L*
Texas.

FRACTURES OF THE LOWER END OF THE HUMERUS. George J.
the American Medical Association, CXII, 623, Feb. 18, 195

This is an analysis of 133 fractures involving the condylar r
effort has been made to determine the prognosis in the different t
the elbow.

In the supracondylar group, consisting of 107 fractures, reducti
50.5 per cent. of the cases, and in 94.4 per cent. of these the end results
the reductions classed as fair, only 9 per cent. had excellent end resul

Early reduction should be done, even when great swelling is present
must be accurate if an excellent result is to be expected. If the limit
however, is due to anterior bone block at the lower end of the upper fr
disappear with the growth of the child.

There were eleven fractures of the medial condyle, with excellent re
per cent. Fifteen patients had lateral condylar fractures, of which six required
tion. The results in the surgically treated cases were superior to those in cases
closed methods.—*Brandon Carrell, M.D., Dallas, Texas.*

FRACTURE OF THE NECK OF THE FEMUR. Martin B. Tinker and Martin B. Tinke
With the Collaboration of A. T. Kerr and W. M. Sawdon. *The Journal of the A*
ican Medical Association, CXII, 791, March 4, 1939.

An effort is made to compare the results of conservative and operative treatment
fracture of the neck of the femur. An attempt is made also to determine the relativ
efficiency of various forms of internal fixation. Of the 2074 cases collected from various
sources that were treated conservatively, bony union developed in 51 per cent. The 980
cases treated operatively, however, had bony union in 78 per cent. Mortality for the
conservatively treated group was 25 per cent., while for those surgically treated it was
only 9 per cent.

The authors made an experimental study of the common methods of internal fixation.
Various appliances were used with the result that the Moore pins proved to be more
efficient than the Smith-Petersen nail. The former, properly placed, will carry a load up
to 300 pounds. They also have a distinct spring, which tends to restore the fracture to
the original reduced position following compression. The three-flanged nail is quite
rigid and produces a definite crushing or destruction of the cancellous bone. The tests
indicated that the pins held the fracture surfaces in better contact and thus provided a
greater opportunity for union.

In order to place the three pins more accurately, one of the authors (M. B. T., Jr.) de-
vised a guide or templet. One pin is placed and is checked by x-ray. The guide is then
fitted onto the nail and accurate placing of the other two pins is assured.

It was emphasized in the discussion of this paper that the final result as to bony
union, viable head, and freedom from changes such as asceptic necrosis, flattening, or loss

of cartilage with ultimate painful coxitis can be determined only after observation of the patient over long periods of time and a study of the specimens obtained after treatment.
—*H. M. Childress, M.D., Dallas, Texas.*

THE AGE-ORDER OF EPIPHYSEAL UNION IN BENGALEE GIRLS (A PRELIMINARY STUDY). Sushil Kumar Basu and Sudhir Basu. *Journal of the Indian Medical Association*, VII, 571, 1938.

The authors present a study of the age-order of epiphyseal union in 130 Bengalee girls. They conclude that the figures usually given in textbooks are too high, and that most epiphyseal unions occur from one to three years earlier than is commonly stated. The coincidence of their results with those of Flecker for Australian girls, however, suggests that local climatic, dietetic, and racial factors may influence figures in these countries as compared with those of America and Europe.—*Robert M. Green, M.D., Boston, Massachusetts.*

LOW BACK PAIN WITH SCIATIC RADIATION. RECENT ADVANCES IN TREATMENT. Maxwell Harbin. *Journal of the Medical Association of Georgia*, XXVII, 147, 1938.

A list of twelve causes of this type of pain is given, but this paper is confined to three entities: fibrositis, herniated intervertebral disc, and hypertrophy of the ligamenta subflava. The history, symptoms, and physical examination of these cases are discussed. Lumbar puncture with study of the spinal fluid is important. Fifty cases diagnosed as fibrositis, in which some type of fascial-stripping operation was performed, are discussed. In 70 per cent. complete relief was obtained. In cases of a herniated intervertebral disc, the intraspinal injection of lipiodal and observation of roentgenograms are necessary to establish a diagnosis. In cases of hypertrophy of the ligamenta subflava surgical treatment gives excellent results. Further study of the cause and cure of these cases of low-back pain is desirable.—*Fred G. Hodgson, M.D., Atlanta, Georgia.*

EXARTICULATIO INTER-TIBIO-CALCANEA AND ITS FUNCTIONAL RESULT. V. Kofmann. *Khirurgiya*, VI, 143, 1938.

In a paper read before the Odessa Surgical Society, Dr. Kofmann points out that in the main the results of an amputation of the lower extremity are judged by the degree of preservation of its supporting function and by the cosmetic effect. Proper preparation of the stump is all-important. The main defect of the older operations (Pirogoff's and Chopart's) was the liability that the distal end of the stump would deviate from its physiological position, affecting the supporting capacity of the stump. Indeed, the apparently normal position for the stump to assume was that of equinus. In half of the total number of cases observed at the Leningrad Prosthesis Institute the stumps were in the equinus position. There was usually also present a considerable restriction of flexion at the ankle joint. This position with the attendant instability accounts for the formation of painful scars, callositics, and ulcers.

Many operative methods have been employed to overcome this equinus position, and, in the main, they have consisted in either an osteoplastic amputation, filing off of the tarsus, and closure of the defect by some one of several techniques, or disarticulation of the navicular and fixation of the tarsus in the mortise of the tibia and fibula. The former type of treatment transforms the tibia and the foot into a straight supporting column, and the latter allows the formation of an artificial joint between the tibiotalar mortise and the os calcis, which results in a more elastic gait and obviates the use of a permanent prosthesis.

The operation which Dr. Kofmann advises is a modification of the second type, consisting of the following steps:

1. Excision of the ulcer;

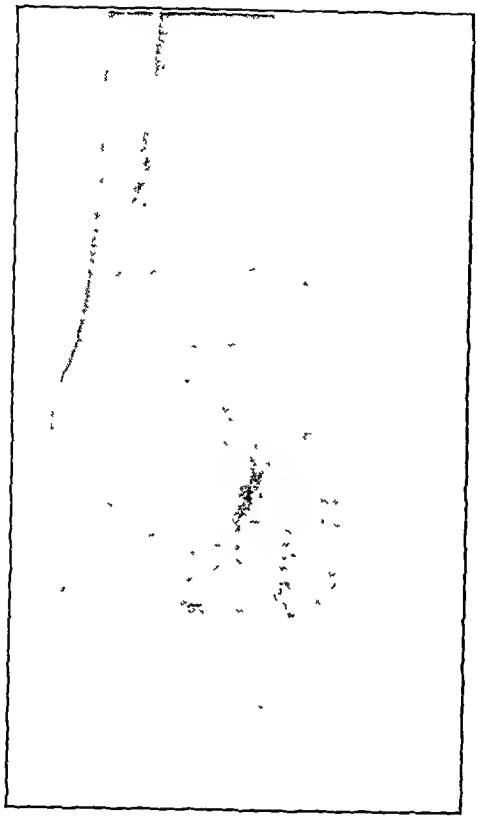

FIG. 1

FIG. 2

2. Disarticulation of the remnant of the navicular and all of the talus;

3. Tendoplasties through a canal in the anterior third of the os calcis, tending to create a counter-tension to the tendo achillis.

This operation may be employed in place of Pirogoff's in either primary or secondary amputations. Figures 1 and 2 show the results which may be obtained by this operation. (These illustrations were recently sent to *The Journal* by the author and were not included in the original article.)

Dr. Kofmann reports in detail a case of ulcer of the stump following Chopart's amputation, in which this technique was used. A male patient, fifty-six years old, was operated upon in the First Surgical Clinic of the Odessa Medical Institute for relief of a painful ulcer in the stump of the right foot following an old amputation. The stump was in a position of equinus. After removal of the talus and the navicular and flattening of the dorsal surface of the os calcis, a tunnel was drilled through the anterior surface of the os calcis, through which the tendons of the peroneus longus and peroneus brevis were passed from within outward, and then secured by a loop. The tendon of the flexor hallucis longus was anchored to that loop along the inner edge. The foot was put up in a plaster-of-Paris cast. Four months later, the patient was able to walk on the stump without using crutches.

The cases of two younger patients are recorded in which this operation was performed with only some slight difference in the selection of the tendons used for passing through the tunnel and in the technique of their fixation. In each of these cases the patient was bearing weight on the stump two weeks after the operation.

The muscle balance necessary to stabilize the ankle and to prevent displacement of the distal end of the stump is dependent upon the attachment of the transferred tendons to the arms of the levers made by the junction of the tibia with the os calcis, one set

being attached in front and the other behind this juncture, which marks the line between the third and fourth quarters of the heel bone.

When there is peripheral irritation, as from painful ulcers, the muscle balance is disturbed and the flexor group gains the upper hand, resulting in the equinus position. The selection of the type of incision which Dr. Kofmann employs, which is outside the point of weight-bearing upon the stump, removes the source of this irritation because it eliminates the cause of the ulceration.

"In our operation, when the pathological peripheral irritations are eliminated and the static conditions are improved, there are no causes for the disturbance of the muscle balance which we have created, and the proper position of the amputation stump is assured. At the same time, it should be borne in mind that, when weight is placed upon the stump of the foot, the gravity of the body may also be considered as an antagonist of the traction of the triceps surae. This, in turn, tends to place the os calcis at a right angle to the tibia. We, therefore, suggest to the patient that he place full weight upon the stump at the earliest possible moment (within the first fortnight)."

GENU VALGUM. W. Sayle Creer. *The Medical Press and Circular*, CXCVII, 376, 1938.

Genu valgum is defined as a deformity in which, when the hips and knees are fully extended and the inner aspects of the knees are in contact, there is an intermalleolar separation.

In discussing the anatomy of the legs, the author points out that the two inferior extremities and the pelvis form an arch and that weight thrusts down the long limbs of this arch tend to make the knee joint gap open on its lateral side. The strong fibular collateral ligament prevents this, but, when weight is borne and stretching of this ligament begins, reflex contraction of the biceps femoris occurs to relieve the strain on the ligament. Also, the adductor muscles pull inward on the lower end of the femur and again close the outer side gap and relieve the ligament from strain. The equal balance of all these three factors preserves the knee-joint angle at all times. Overaction of either the biceps femoris or the adductor muscles will produce valgus.

In the production of genu valgum the author dismisses the obvious causes, such as malunion, developmental defects, etc., and seeks to explain the development of genu valgum in rickets as a hypertonicity of the muscles reflexly set up by strains at the epiphyseal disc. This of course is true, if the valgus is femoral in location rather than tibial, but any valgus occurring in the tibia is almost always developmental or a result of an injury.

A brief résumé of accepted methods of treatment is given.—*Herbert E. Hipps, M.D., Marlin, Texas.*

COXA VARA EPIPHYSARIA UND UNFALLBEGUTACHTUNG. (MIT EINIGEN BEMERKUNGEN ZUR ÄTIOLOGIE.) [Epiphyseal Coxa Vara and Industrial Insurance. (With Remarks on Etiology.)] Hans-Heinz Mutschler. *Monatsschrift für Unfallheilkunde*, XLVI, 15, Jan. 1939.

Observations have been made on nine patients, eight of whom were treated by the author. The brief case records of five patients show the following facts:

1. All were victims of minor accidents to which they attributed the onset of the clinical manifestations.

2. All had, for days or weeks previous to the alleged injury, signs of distinct disturbance in the extremity which was subsequently affected.

3. The patients ranged in age from fourteen to seventeen years, and all presented the syndrome of dystrophia adiposogenitalis.

4. The process of consolidation at the point of separation was slow.

The form of therapy which was employed was the closed method of reduction according to Lorenz and Whitman.

The etiological factors which are discussed are trophic and endocrine disturbances and the mechanics of weight-bearing.—*R. J. Dittrich, M.D., Fort Scott, Kansas.*

ACROMIOCLAVICULAR DISLOCATION. A CONSERVATIVE METHOD OF TREATMENT. Roger Anderson and Ernest Burgess. *Northwest Medicine*, XXXVIII, 40, Feb. 1939.

The authors believe that fundamentally such injuries should be treated conservatively, providing the severed parts can be effectively immobilized, and that operation need be resorted to only in old cases. They have, therefore, devised a splint, which suspends the shoulder joint by means of an axillary saddle supported by a downward-tension strap passing over the outer third of the dislocated clavicle. They report very satisfactory results from such treatment.—*Charles Lyle Hawk, M.D., Los Angeles, California.*

FRACTURES OF THE HIP JOINT. EXTRAARTICULAR FIXATION WITH A SINGLE SCREW. George W. Freeman. *Northwest Medicine*, XXXVIII, 46, Feb. 1939.

The fractured head of the femur is held in place by a single screw, which is threaded from the point for only about one-fourth its length. These screws have a diameter of eleven sixty-fourths of an inch and are from three and three-fourths to four inches long. They are made of stainless steel. One screw only is used as a rule. The patients are allowed up at the end of the first week, but they are restrained from weight-bearing for at least five months. Uniformly good results have been obtained in thirty-two cases.—*Charles Lyle Hawk, M.D., Los Angeles, California.*

LA VITAMINE B_1 DANS LE TRAITEMENT DES ALGIES (Vitamin B_1 in the Treatment of the "Algias"). F. Coste et J. Metzger. *La Presse Médicale*, XLVI, 1433, 1938.

Without attempting any explanation of its mechanism, the authors recommend the use of vitamin B_1 in the treatment of sciatica, cervicobrachial neuralgia, periarthritis of the shoulder, and other types of "algias". They administer two centigrams of the drug intravenously daily, or at least every other day, and claim satisfactory results in cases which had remained resistant to all other forms of treatment. There are no contraindications to its use.

Of ten cases of sciatica, they were able to bring about cure or marked improvement in six. Of the other four, there was no improvement in two, and the results were incomplete in two. In eight cases of cervicobrachial neuralgia and scapulohumeral periarthritis, they obtained four good and four incomplete results. In five cases of arthritis of the hip, there were two good results and three negative results. In one case of intractable post-herpetic pain, this treatment brought relief, after other therapy had proved unavailing.—*Henry Milch, M.D., New York, N. Y.*

DE L'ACTION VASO-DILATATRICE DE LA NOVOCAINE. NATURE PHYSIOLOGIQUE DES EFFETS THÉRAPEUTIQUES DE L'INFILTRATION NOVOCAÏNIQUE (The Vasodilating Action of Novocain. The Physiological Nature of the Therapeutic Effects of Novocain Infiltration). René Leriche. *La Presse Médicale*, XLVI, 1625, 1938.

Leriche calls attention to the fact that the action of novocain on the cerebrospinal nerves is analgesic and paralytic. Novocain produces vasodilatation of the sympathetic nerves. This occurs locally wherever the solution is injected, and the effect is the same whether the solution is actually injected into the sympathetic system or merely bathes one of its component parts.

Thus, when novocain is injected into the stellate ganglion or around it, the effect is identical with that produced by ganglionectomy. The value of this therapy in the treat-

ment of sprains of various joints lies not in the abolition of pain, but in the elimination of the vasoconstricting impulses, due to the trauma. This is shown by the fact that in those cases in which adrenalin is added to the solution the desired effect is not obtained, although the analgesic effect of the novocain is prolonged. In some cases the injection of novocain into infected areas has led to subsidence of the inflammatory process, even where systemic symptoms had already become manifest.

Leriche observes that the local injection of novocain may have a systemic effect. He does not call attention to any ill effects beyond slight vertigo, even after intravenous injection. He stresses the fact that novocainization of the sympathetic nerves is a method of general significance, with great therapeutic possibilities.—*Henry Milch, M.D., New York, N. Y.*

SUR L'ANÉVRYSME ARTÉRIEL DE VOISINAGE ET DE LA GANGRÈNE ISCHÉMISQUE DES DOIGTS EN RAPPORT AVEC LES CÔTES CERVICALES. Aneurysm and Ischaemic Gangrene of the Fingers in Relation to Cervical Ribs. A. Baumgartner, A. Clerc, et C. Macrez. *La Presse Médicale*, XLVI, 1665, 1938.

The authors report the case of a woman, aged twenty-four, in whom signs of gangrene developed. Examination disclosed bilateral cervical rib and evidence of an aneurysm of the subclavian artery. At operation the rib was excised, and, after ligature, the aneurysm of the subclavian artery was resected. The patient recovered, with loss of the terminal phalanges of the thumb and index finger.

The authors note that, while the neurological manifestations may be attributed entirely to the presence of the cervical rib, the circulatory disturbances cannot be explained on a purely mechanical basis. They insist that the rib must lead to endarterial pathology, which is the proximate cause of the vascular disturbances. As a consequence, they advise that in patients operated upon for gangrene, associated with cervical rib, special attention be given to the condition of the subclavian artery. If the artery is found patent, they recommend resection of the rib and periarterial sympathectomy. If the artery is not patent, resection of the artery is to be recommended.—*Henry Milch, M.D., New York, N. Y.*

CÔTE CERVICALE ET SYNDROME DE KIENBÖCK DU SEMI-LUNAIRE (Cervical Rib and Kienbock's Lunate Syndrome). Pierre Mallet-Guy et Henri Cavailher. *La Presse Médicale*, XLVI, 1721, 1938.

The authors present the case of a female, aged twenty-one, treated for chronic arthritis of the wrist. All forms of conservative therapy were unavailing for the relief of pain or of limitation of motion. There was no history of antecedent trauma. Roentgenograms showed lacunar formation in the navicular and the radial styloid. Several months later these bones had become recalcified, but the lunate presented the typical cyst-like appearance. During the course of the examination, a cervical rib was found. The rib was resected and a periarterial sympathectomy of the subclavian artery was performed, with relief of pain and satisfactory return of functional capacity.

In the authors' opinion, the importance of the case lies in its illustration of Leriche's concept of the relationship between osteo-articular changes and vasomotor disturbances of sympathetic origin. For them, this hypothesis appears to explain the pathogenesis of Kienbock's disease better than the theories of trauma, infection, or congenital anomaly. They believe that periarterial sympathectomy should be performed in the resistant cases in preference to enucleation of the affected lunate.—*Henry Milch, M.D., New York, N. Y.*

INFILTRATION DU GANGLION STELLAIRE ET DE LA CHAINE THORACIQUE SUPÉRIEURE PAR VOIE SUPÉRO-EXTERNE (Infiltration of the Stellate Ganglion and the Upper Thoracic Chain by the Superolateral Route). Georges Arnulf. *La Presse Médicale*, XLVI, 1726, 1938.

Novocain infiltration into the stellate ganglion, to bring about vasodilatation of the upper extremity, is indicated in conditions such as Raynaud's disease, the post-traumatic

physiopathies, causalgias, and other vascular disturbances. The appearance of Bernard-Horner's syndrome and especially hyperthermia of the involved limb are the characteristic signs of successful injections. Injection of the stellate ganglion may be accomplished through the anterior approach described by Leriche, through the lateral approach of Goinard, or through the posterior approach recommended by White.

Experience has shown that anaesthetization of the ganglion itself does not give the maximum effect. To achieve this, the infiltration must be extended to include the upper ganglia of the thoracic sympathetic chain. Wertheimer and Trillat use the posterior approach through the second and third intercostal spaces to accomplish this.

To avoid the necessity of two punctures, the author devised a superolateral approach, through which it is possible to infiltrate both the stellate ganglion and the upper thoracic ganglia. The author uses a ten to twenty-cubic-centimeter syringe, armed with a thin needle about ten centimeters long. The patient lies in the supine position, with the head turned to the opposite side and slightly extended by means of a pillow beneath the shoulders. The skin is punctured at a point about five centimeters above the junction of the inner and middle thirds of the clavicle. This point corresponds to the angle formed by the posterior border of the sternocleidomastoid muscle and the external jugular vein. With the operator's finger on the transverse process of the sixth cervical vertebra, the point of the needle is directed downward, inward, and backward toward the subjacent transverse process of the seventh cervical vertebra. Several centimeters of 1-per-cent. novocain are injected. The needle is then turned until it is parallel with the axis of the neck. Closely hugging the bony structures, in order to avoid the vessels, the needle is gradually advanced a distance of from eight to ten centimeters, injecting novocain along its path. When this distance has been reached, from ten to fifteen cubic centimeters of novocain are injected.

The needle is left *in situ* until Bernard-Horner's syndrome and hyperthermia of the extremity are observed. If the latter sign does not manifest itself within from ten to fifteen minutes, more novocain is injected in the vicinity.

Occasionally a small hematoma, which can be controlled by pressure, develops. The most annoying complication, puncture of the pleura, is characterized by pleural pain and fits of coughing, with blood-tinged sputum if the lung has been injured. This annoying situation can be avoided by directing the needle point close to the osseous structures.—*Henry Milch, M.D., New York, N. Y.*

Osteogenesis Imperfecta Tarda. A. F. Gutiérrez Solis y Pablo Izaguirre. *Revista de la Policlínica Caracas*, No. 40, 1938.

The authors report a case of osteogenesis imperfecta tarda in a girl who was apparently normal until she tried to walk. She then had a tumefaction of the right knee with very acute pain. After eighteen days, the knee again appeared normal, but when she attempted to get up she sustained a fracture of the middle third of the right femur. The leg was immobilized for twenty-two days. After this accident she seemed to develop normally for about three years, but her progress in walking was very slow. When she reached seven years of age, she had had twelve fractures (femora, humerus, and forearms); there was no pain at the fracture sites, and consolidation had taken place rapidly. At the age of eleven, she fell from a chair and fractured the middle third of the right humerus. At this time a physical examination showed a girl in apparently good general health, but, although she was able to stand up with help, she could not maintain the standing position by herself. Several roentgenograms showing the deformation of the bones are presented, and the authors point out the difficulties of carrying out successful treatment.—*Abraham Schwartz, M.D., Santiago, Chile.*

Pseudarthrosis of the Long Bones. Arnold Pavlík. *Slovanský Sborník Ortopedický*, XIII, 261, 1938.

In treating pseudarthrosis of the long bones the author prefers the method of Albee, and generally completes it by drilling the fragments after the manner of Beck. By this

method of applying a strong graft with its periosteum, even the most difficult cases of pseudarthrosis can be cured. Sometimes it is sufficient to fix the graft by means of a silk thread or wire. Only in exceptional cases is the graft not fixed, and then it is inserted in a groove cut in both fragments with a double saw. The drilling does not cure the pseudarthrosis; it is effective only in cases where the fracture heals slowly. Drilling can be harmful if it is done by means of an electric drill which overheats the bone and causes necrosis.

SUBACROMIAL BURSITIS. Joseph D. Collins. *Southern Medical Journal*, XXXI, 1098, 1938.

The etiology, anatomy, and pathology of this condition are discussed. The symptoms are variable, and the onset may be insidious or abrupt. Pain may be very severe in acute cases, and its location is variable. Tenderness may or may not be definitely located. Limitation of motion may be extended or slight. Abduction and external rotation are chiefly limited. Only one certain motion may cause pain. Chronic cases may have acute exacerbations. The differential diagnosis is discussed.

The treatment of acute cases consists in the administration of morphine, heat, and rest. If conservative treatment fails, it may be necessary to incise the bursa and to drain off the calcified material. Adhesions are broken up, and the wound is closed without drainage. Exercises are instituted early to prevent formation of adhesions. Injection of the sac with saline solution under local anaesthesia will relieve some cases.—*Fred G. Hodgson, M.D., Atlanta, Georgia.*

USE OF STAINLESS STEEL RODS TO CANALIZE FLEXOR TENDON SHEATHS. H. vH. Thatcher. *Southern Medical Journal*, XXXII, 13, Jan. 1939.

These rods are readily obtainable in diameters between five thirty-seconds and seven thirty-seconds of an inch. They do not cause tissue reaction, nor are they corroded by the tissues. A rod of the proper length is selected, and curved to fit a slightly flexed finger. The details of preparation and the technique of operation are given. The rod is left in long enough to form a definite canal in the finger. The palmaris longus or a tendon from the foot is used to replace the former tendon after the steel rod is removed. Early activity of the new tendon is necessary. This method has produced functioning fingers.—*Fred G. Hodgson, M.D., Atlanta, Georgia.*

TREATMENT OF UNUNITED FRACTURE OF THE NECK OF THE FEMUR. Paul C. Colonna. *Southern Medical Journal*, XXXII, 65, Jan. 1939.

If marked arthritis is present in a case of this type, any operative procedure will probably be of no avail. Conservative treatment is advised. Occasionally a Schanz or a McMurray type of subtrochanteric osteotomy or an arthrodesis may give a good result. A careful roentgenographic study of the hip should always be made. Colonna advises "a careful removal of the abductor group of muscles from their normal insertion, removal of the necrotic head fragment, and the insertion of the upper end of the femur deeply into the acetabulum. The abductor muscles are then resutured downward on the shaft of the femur into a bony canal, and the patient is immobilized for one month in a plaster spica." One hundred such reconstruction operations have been done by this method to date.—*Fred G. Hodgson, M.D., Atlanta, Georgia.*

FRACTURE AND FRACTURE-DISLOCATION OF THE ASTRAGALUS. Oscar Lee Miller and Lenox Dial Baker *Southern Medical Journal*, XXXII, 125, Feb. 1939.

Injury of the astragalus is comparatively rare and often gives rise to considerable disability. The anatomy and function of the astragalus are discussed, and the various

types of fractures and fracture-dislocations are presented. Accurate reduction is most important and may require open operation. This should be done as early as possible, as soon as the condition of the tissues will permit, preferably in the first ten days or two weeks. The authors are opposed to doing astragalectomy if it can be possibly avoided, for this operation in adults frequently results in deformed and crippled feet Subastragalar or triple arthrodesis, done primarily or later on account of pain, produces better results. A chart showing treatment and results in thirty cases is given. This is an excellent paper and should be read by all who treat fractures.—*Fred G. Hodgson, M D., Atlanta, Georgia.*

THE TECHNIQUE OF NAILING OF FRACTURES OF THE NECK OF THE FEMUR. Carl Semb. *Surgery*, IV, 321, 1938.

The author reports in detail his methods of treatment of fractures of the neck of the femur and the end results obtained. All patients with fractures of the femoral neck are treated by wire traction, the wire being inserted through the region of the tibial tubercle. The leg is immobilized in a special splint, which allows flexion, abduction, and extreme internal rotation of the leg. In 98 per cent of the cases accurate anatomical reduction of the fracture has been obtained within a few days after the application of traction. A Smith-Petersen nail is then introduced by means of a special guide, under roentgenographic control, through a small lateral incision. The operation is performed under novocain anaesthesia with a minimum amount of general anaesthesia at the time of introduction of the nail. The operation is performed with the patient lying in bed, the leg being immobilized on the splint. Postoperatively, immobilization with the splint is continued for seven days. At the end of that time the sutures and the splint are removed, and exercises are begun. The patient is kept in bed for eight weeks after the operation Weight-bearing is begun at that time.

In 117 cases in which nailing was performed, there were no cases of infection. Two subcutaneous hematomata developed and required drainage. Thrombosis or embolism occurred in nine cases. There was no immediate operative mortality. Four deaths occurred within two months after operation. Of fifty-five cases which were followed long enough to decide the question of bony union, there were two in which union definitely failed to occur and one doubtful case Ninety per cent. of the patients had an excellent or good gait. The original article should be consulted for details of the technique of the nailing

TUMORS OF THE SYNOVIA, TENDONS, AND JOINT CAPSULES OF THE HANDS AND FEET. Alexander Brunschwig. *Surgery*, V, 101, Jan. 1939.

TUMORS PRIMARY IN THE BONES OF THE HANDS AND FEET. Bradley L Coley and Norman L. Higinbotham *Surgery*, V, 112, Jan. 1939.

The January 1939 issue of *Surgery* contains a "Symposium on Tumors of Hands and Feet", which should be read in its entirety by all surgeons interested in the treatment of benign and malignant tumors. Tumors of the synovia, tendons, and joint capsules of the hands and feet are discussed by Alexander Brunschwig The ganglion, the fibroma, the xanthoma, the lipoma, the osteochondroma, and the osteoma are considered as benign tumors. Treatment of all is local excision with the exception of the ganglion, which may be treated by rupturing the ganglion or by aspiration and injection of some sclerosing solution. The author classifies the malignant tumors into four types (1) synovioma; (2) spindle-cell sarcoma; (3) round-cell sarcoma; and (4) primary malignant chondrosarcoma, or a benign osteocartilaginous tumor which has undergone malignant degeneration All of these malignant tumors were considered radioresistant, and radical amputation was advised.

Coley and Higinbotham discuss the primary tumors in the bones of the hands and feet They find that such tumors are rare, reporting forty-seven cases of involvement of

the bones of the hands and feet out of a total of 1211 bone tumors at the Memorial Hospital and the Hospital for the Ruptured and Crippled. There were twelve cases of osteogenic sarcoma, six of Ewing's endothelioma, and nine of giant-cell tumor. The treatment recommended for osteogenic sarcoma is immediate radical amputation. Treatment advised for endothelioma (Ewing's sarcoma) is heavy irradiation followed by amputation and a postoperative course of injections of Coley's toxins. For giant-cell tumors the authors advocate either surgery or irradiation, but never both. In most instances radical surgery, such as amputation or resection, was found to be unnecessary, as satisfactory results were obtained with curettage, cauterization of the cavity with zinc chloride, and primary wound closure. There were two cases of simple cysts, fifteen cases of chondroma, two cases of metastatic lesions including the bones of the hands and feet, and one case of angiosarcoma. The treatment of these conditions is surgery of the same type as recommended for giant-cell tumors.

The Alternation of Blood Supply as a Cause for Normal Calcification of Bone. Harry C. Blair. *Surgery, Gynecology and Obstetrics*, LXVII, 413, 1938.

The author offers the theory that alternating ischaemia and hyperaemia maintain normal calcification of bone and aid in the healing of fractures. This alternation is produced by the contraction and relaxation of muscles. The writer makes the point that while increased amount of blood (hyperaemia) itself causes bone atrophy, hindering fracture healing, and ischaemia produces bone necrosis, the alternation of the two causes normal calcification.

Heat should not be used about healing fractures, but, rather, about areas of aberrant calcification. Massage falls in the same category. Contrast baths may act in alternating the blood supply, although muscle contraction is better. For fractures of the carpal navicular, fixation in a dorsal splint with free use of the thumb and fingers is indicated. Success in internal fixation of the neck of the femur may be partially due to the muscle activity which this method permits.—*Richard McGovney, M.D., Santa Barbara, California.*

Scoliosis. Samuel Kleinberg. *Surgery, Gynecology and Obstetrics*, LXVII, 467, 1938.

The writer stresses early recognition and persistent treatment in the management of scoliosis. In defining scoliosis, he notes the distortion of anatomy and physiology of the viscera accompanying the spinal curvature. The types are discussed as functional and structural, the latter being divided into several subgroups.

The etiology is congenital, with or without manifest bone deformity, and acquired of known (a small group) or unknown cause. Of the known causes, rickets, infantile paralysis, lesions of the chest, inequality of the lower extremities, defective vision, torticollis, neurological disturbances, heart disease, and heredity are discussed. Idiopathic scoliosis, of which the cause is unknown, represents approximately 70 per cent. of the total number of cases.

Prophylaxis is important. In 80 per cent. of the cases the onset occurs between the ages of seven and ten years. Frequent physical examination at this period with attention to back examination, including the forward flexed position, is indicated.

The treatment depends upon the age, type, degree, and progress of the curvature. It includes postural exercises, plaster jackets, recumbent traction and jacket, and spinal fusion. The latter is indicated in uncontrolled scoliosis and in severe cases of back ache.

Eighty per cent. of the cases can be adequately treated conservatively.—*Richard McGovney, M.D., Santa Barbara, California.*

Die Sakralisation des 5. Lendenwirbels (Sacralization of the Fifth Lumbar Vertebra). G. Hohmann. *Zeitschrift für ärztliche Fortbildung*, XXXV, 667, 1938.

Sacralization of the fifth lumbar vertebra consists of an enlargement of the transverse process, so that it forms a bony union or a nearthrosis either with the ilium or with the sacrum or with both. It is frequently combined with a spina bifida occulta of the fifth

lumbar or first sacral vertebra, which is always without significance. The sacralization may be bilateral, in which case there is no deformity nor disability. In unilateral sacralization, there is often a scoliosis with severe pain radiating to the lower extremities in the distribution of the sciatic nerve. Treatment consists in the application of a short plaster cast to the lower part of the spine. This cast may later be replaced by a heavy corset. If this form of treatment is ineffective, it is necessary to resect the offending transverse process.—*R. J. Dittrich, M.D., Fort Scott, Kansas.*

Über Verschiebung von Wirbeln. Spondylolyse, Spondylolisthesis, Wirbelverschiebung nach hinten, Drehgleitung bei Lendenskoliose (Subluxation of Vertebrae. Spondylolysis, Spondylolisthesis, Posterior Subluxation, Rotary Subluxation with Lumbar Scoliosis). G. Hohmann. *Zeitschrift für ärztliche Fortbildung*, XXXV, 616, 1938.

In spondylolisthesis the cause is a congenital defect, consisting of a lack of bone fusion in the vertebral arch between the superior and the inferior articular processes. The chief symptom is pain in the muscles of the back, especially with forward flexion of the spine. On examination the most important finding is a gutter-like retraction of the spinous processes above the subluxated vertebra. The diagnosis is confirmed by roentgenographic examination. The treatment consists in the application of a short heavy corset to the spine for immobilization. If this is ineffective, then spine fusion is indicated. This should include the sacrum and the lower three lumbar vertebrae.

In posterior subluxation and in rotary subluxation the underlying cause is usually a degeneration of the intervertebral disc.—*R. J. Dittrich, M.D., Fort Scott, Kansas.*

The Journal wishes to acknowledge the receipt of the following publications sent to the Editorial Department:

Boletim Clínico e de Estatística dos Hospitais Civis de Lisboa, I, No. 4, 1937; II, No. 5, 1938.

Boletín de la Sociedad de Cirugía de Montevideo, IX, Nos. 4, 5, and 6, 1938.

Boletines de la Sociedad de Cirugía de Rosario, V, No. 7, 1938.

The Child (Washington, D. C.), III, Nos. 5 and 6, November and December, 1938; III, Nos. 7 and 8, January and February, 1939.

Cleveland Clinic Quarterly, V, No. 4, 1938; VI, Nos. 1 and 2, 1939.

Current Medicine (Los Angeles), VI, No. 1, 1939.

Gaceta Peruana de Cirugía y Medicina (Lima), I, No. 9, 1938.

Mississippi Valley Medical Journal (Quincy, Illinois), LXI, Nos. 1 and 2, 1939.

La Pratica Chirurgica e delle Discipline Affini, V, No. 2, August 1938. (The Current Literature Section of this issue is arranged on cards and accompanied by guide cards giving the names of the various departments of surgery. This method of presenting current abstracts in the form of a card file—termed "*schedario bibliografico*"—appears to be a useful innovation.)

The Punjab Medical Journal (Banga), IV, No. 1, 1939.

Radiography and Clinical Photography (Rochester, N. Y.), XV, No. 1, 1939.

Revue Médico-Chirurgicale, Bulletin de la Soc. des Médicins et des Naturalistes de Jassy (Rumania), XLIX, No. 1–2, 1938.

Roche Review (Nutley, N. J.), III, No. 3, 1938; III, Nos. 4, 5, and 6, 1939.

Surgical Digest and Forum (Chicago), II, No. 4, 1938; II, No. 6, 1939.

La Tribuna Médica (Habana), XII, Nos. 250 and 251, 1938.

Vida Nueva (Habana), XLII, Nos. 5 and 6, 1938; XLIII, Nos. 1 and 2, 1939.

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